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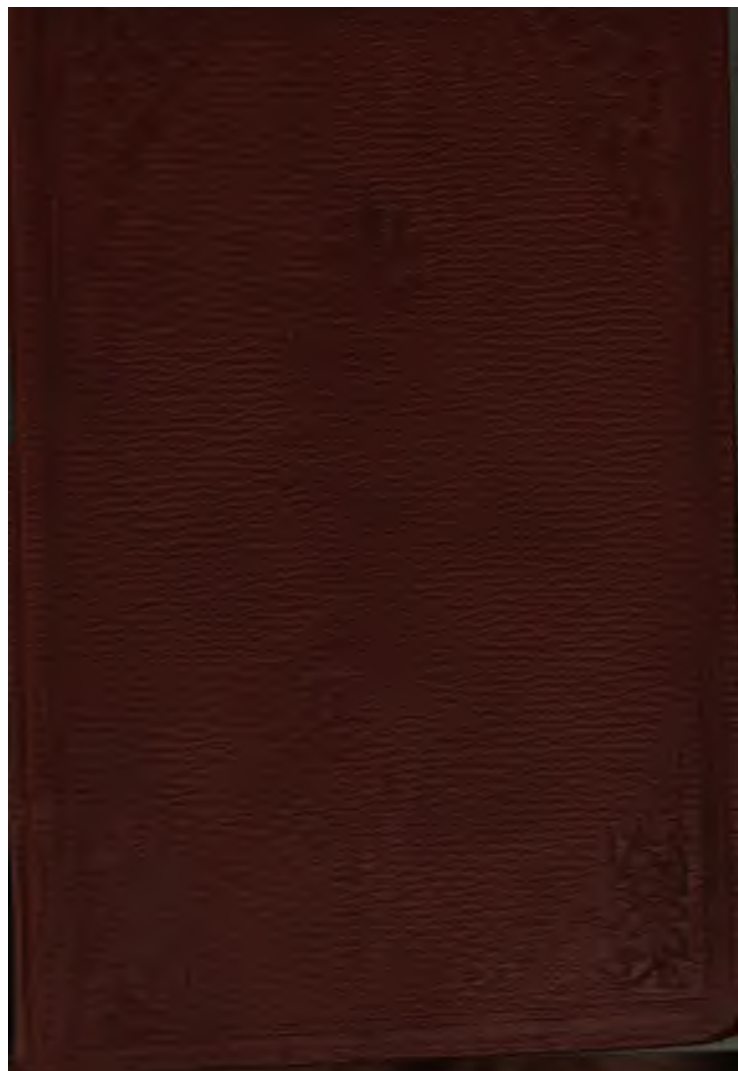
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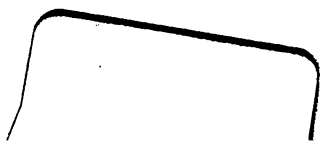
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THE
ARTS OF LIFE.

LONDON :
PRINTED BY SPOTTISWOODE AND CO.
NEW-STREET SQUARE.

THE
ARTS OF LIFE.

- I. OF PROVIDING FOOD.
- II. OF PROVIDING CLOTHING.
- III. OF PROVIDING SHELTER.

Described in a Series of Letters

FOR THE INSTRUCTION OF YOUNG PERSONS.

BY THE AUTHOR OF "EVENINGS AT HOME."

A NEW EDITION, WITH ADDITIONS AND ALTERATIONS

BY LUCY AIKIN.

LONDON:
LONGMAN, BROWN, GREEN, LONGMANS, AND ROBERTS.
1858.

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P R E F A C E.

IT is somewhat more than sixty years since Dr. Aikin gave to the world his "Evenings at Home," a work which has fully kept pace in circulation and in general esteem with the wide and rapid spread of popular instruction. Some years later he published the small volume entitled "Arts of Life," designed to impart, under the form of letters to a school-boy, a kind of knowledge too little cultivated, as he thought, under the ordinary system of education. More important avocations prevented him from following up his

design to a greater extent, and the public mind was not as yet awake to the inconveniences of the general ignorance or inattention with respect to these topics. The work had been many years out of print, when some remarks, from a high authority, on the importance of an acquaintance with "common things," recalled to the mind of the editor the modest little volume of her father.

To give it the corrections and additions required by the immense advances in the application of mechanical and chemical science to manufacture made within the present century, chiefly through the seven-league strides of the gigantic power of steam, has been to her a "labour of love." The chief materials for this purpose she found in the "Illustrations" addressed by



her late brother, Mr. Arthur Aikin, to the Society of Arts, Manufacture and Commerce, and published in its Transactions. She has also been indebted for valuable facts and suggestions to the very learned work of Mr. James Yates, entitled "*Textrinum Antiquorum.*" Several narratives of travels have likewise supplied her with fresh information.



CONTENTS.

LETTER I.

| | Page |
|------------------------|------|
| INTRODUCTORY | 1 |

LETTER II.

| | |
|--|---|
| ON THE ARTS RELATIVE TO FOOD | 6 |
|--|---|

LETTER III.

| | |
|---|----|
| ON VEGETABLE ARTICLES OF FOOD | 21 |
|---|----|

LETTER IV.

| | |
|---|----|
| ON VEGETABLE ARTICLES OF FOOD CONTINUED | 36 |
|---|----|

LETTER V.

| | |
|--------------------------|----|
| ON AGRICULTURE | 45 |
|--------------------------|----|

LETTER VI.

| | |
|---------------------------------|----|
| AGRICULTURE CONTINUED | 56 |
|---------------------------------|----|

LETTER VII.

| | |
|--|-------------|
| AGRICULTURE CONTINUED | Page |
| | 67 |

LETTER VIII.

| | |
|--|-----------|
| ON ANIMAL FOOD, AND THE MEANS OF PROCURING IT | 78 |
|--|-----------|

LETTER IX.

| | |
|---|-----------|
| ON THE PREPARATION OF FOOD | 96 |
|---|-----------|

LETTER X.

| | |
|--------------------------|------------|
| COOKERY | 104 |
|--------------------------|------------|

LETTER XI.

| | |
|---|------------|
| ON THE ARTS RELATIVE TO CLOTHING | 114 |
|---|------------|

LETTER XII.

| | |
|---|------------|
| VEGETABLE CLOTHING CONTINUED | 129 |
|---|------------|

LETTER XIII.

| | |
|---|------------|
| ON CLOTHING DERIVED FROM ANIMALS | 142 |
|---|------------|

LETTER XIV.

| | |
|--|------------|
| ANIMAL CLOTHING CONTINUED.—WOOL | 153 |
|--|------------|

CONTENTS.

xi

LETTER XV.

| | Page |
|-------------------------------------|------|
| ANIMAL CLOTHING CONTINUED.—SILK . . | 163 |

LETTER XVI.

| | |
|----------------------------------|-----|
| THE MANUFACTURE OF LEATHER . . . | 175 |
|----------------------------------|-----|

LETTER XVII.

| | |
|--------------------------------------|-----|
| ON THE ARTS OF PROVIDING SHELTER . . | 187 |
|--------------------------------------|-----|

LETTER XVIII.

| | |
|---------------------------------|-----|
| ARTS OF SHELTER CONTINUED . . . | 204 |
|---------------------------------|-----|

LETTER XIX.

| | |
|---------------------------------|-----|
| ARTS OF SHELTER CONTINUED . . . | 217 |
|---------------------------------|-----|



THE
ARTS OF LIFE.

LETTER I.

INTRODUCTORY.

MY DEAR BOY,—Though you are now a stout active fellow, and can work in your garden, and do a variety of things besides playing, yet I think you must have some recollection of the time when you were a helpless little infant, fit for nothing but to be fed and dressed by your nurse. You must probably have observed, too, that the very young animals of other kinds are, for the most part, unable to shift for themselves, and would soon perish without the care of their parents. Puppies and kittens, you know, are blind when they

come into the world, and their limbs are so weak, that they can but just crawl about. Unfledged birds are only fit to lie in the nest, and open their mouths when the old ones bring them food. But all these animals, when grown to a tolerable size, are able to get their living in the way that nature intended for them; and no one ever knew them die of hunger or cold for want of sufficient skill to procure themselves provision or shelter, where they were to be had.

But it is not so with man. He not only comes into the world the most feeble and naked of all young creatures, but, after he has acquired the proper use of his limbs and senses, he is very unequal to the task of providing himself with necessaries, unless taught by those who have already enjoyed the benefit of experience. And even if he can thus just manage to keep himself alive, it will often take several generations, in a new country, before he finds out what can best contribute to his comfort and convenience. In many climates there are no fruits or other vegetable products growing wild which will serve him for wholesome food, at least with-

out some preparation. He can seldom overtake quadrupeds or birds, or catch fish, by his mere bodily powers, unaided by some contrivance. He never acquires from nature, as all other creatures do, a covering for his body sufficient to protect him from the impressions of cold and heat; and caves and woods afford him but an imperfect shelter against the inclemencies of the seasons. The use of fire, which is in many ways so necessary to him, is not taught him by instinct, but must have been learned by observation or by accident; and the simplest tools have to be invented, and the properties of all the substances which surround him to be discovered by labour, and thought, and repeated experiments. For everything valuable, therefore, man is indebted to *art*, and the first use of his reason is to suggest to him such contrivances as are most essential to his welfare.

It is these primitive devices which I mean to make the subject of a set of letters to you. For although, in the state of society in which we live, persons of the superior classes are seldom called upon to exercise the common arts

of life, they deserve to be studied as results of human skill and invention, and I consider it as unworthy of a man so far to rely upon the exertions of others, as to sit down contented with the utter inability of subsisting himself a single day without help. Many are the instances of travellers by sea and land being thrown into situations in which they must provide for themselves, or perish. In such cases, how precious to them would be a little knowledge of those arts which they may perhaps have disdained as beneath their notice. What would a mere scholar or fine gentleman have done in the place of Alexander Selkirk, when left alone in the island of Juan Fernandez? And how ill do many of our gentleman emigrants fare at this day amid the gold-diggings of Australia, where a common workman makes a fortune by his skill, and the readiness with which he can turn his hand to the commonest arts! In the times of antiquity, the inventors or importers of useful arts have been treated with divine honours; and indeed what greater human benefactor can be conceived, than one who, coming among a savage people, scarcely able to subsist, in want and wretchedness,

should teach them the means of acquiring comfort and plenty?

The arts of life may be divided into those, 1st, absolutely necessary for its preservation : 2dly, conducive to comfort and convenience : 3dly, ministering to luxury or pleasure. It is the first two to which I shall confine myself in these letters ; and as it is not possible to draw any exact limits between them, I shall not attempt to make the separation, but at the same time shall consider the means both of *being* and of *well-being*. A more useful order to follow, will be that of the particular purpose of these arts ; such as the providing of food, clothing, lodging, and other domestic accommodations. My next letter will make a beginning of these topics ; meanwhile, my young friend, farewell, and accept my best wishes for your progress in every kind of valuable knowledge.

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LETTER II.

ON THE ARTS RELATIVE TO FOOD.

MY DEAR BOY,—As I learn that you are impatient to be taught how you might live by yourself, I will lose no time in beginning my instructions.

I commence with food, as the article which may justly claim a precedence over others, since it is the first thing supplied by nature herself to the new-born animal, and satisfies the most urgent of his wants.

I believe I need say little to a school-boy on the importance of a plentiful supply of food. It may, however, be of advantage to you to be told that the *proper use* of food to the animal frame is to make up for that waste of solid and fluid parts which constantly goes on as long as life endures; and that the *desire* for food is owing to an uneasy sensation in the stomach, produced by the gnawing or corrod-

ing properties of a liquor formed there, called the gastric juice, which, for want of other matter to act upon, preys on the empty stomach itself. This is fair honest *hunger*, a painful feeling, but serving the useful purpose of exciting us to the procuring of a regular supply of what is necessary to life. You are not to suppose, however, that going without a meal or two will do you any lasting harm. The stomach gives early warning of its wants, but it may be taught patience; and in many employments and modes of life the intervals of abstinence must frequently be long. Some of the savage hunter-tribes often undergo fasting for days together, in pursuit of their prey. In such cases it is said that they blunt the sense of hunger by squeezing the stomach between two boards bound tightly together; but this is one of the *arts of life* which I hope you will have no occasion to practise. Soon after our conquest of the colony of the Cape of Good Hope from the Dutch, an exploring expedition sent up the country encountered a dwarfish tribe of savages called Bushmen, who afforded a remarkable example of human endurance in this matter. These

poor creatures, who had been robbed by their stronger neighbours of all their cattle, and driven away from their native haunts, were reduced as nearly as possible to the state of wild beasts of the desert. Their sole resource was in the poisoned arrows which, lurking behind rocks, or in the midst of thickets, they aimed at the passing game. Whenever this failed them, they were reduced to the utmost extremity; but, like other carnivorous animals, they were able to make up for their long abstinence by an excess of voracity, when a plentiful booty fell in their way, almost incredible to civilised men. A whole flock of sheep being given to them just after they had finished an enormous meal, they killed and immediately devoured the whole, amounting to two or three sheep a man, without suffering any visible inconvenience from thus gorging themselves. Such is the extent of that faculty of adapting his habits to all circumstances and situations, in which the human animal excels every other!

It is a proof of the benevolence of our Creator, that the necessary action of taking food should not only free us from a pain, but

should be itself a source of pleasure. This is produced by means of the sense of *taste*, the principal seat of which is the palate or roof of the mouth; and it may in general be taken for a rule, that the same things which are agreeable to the taste, are proper articles of food, so that even the fancies and longings of the sick are not to be neglected. But this maxim is to be understood with moderation, for things are not wholesome in proportion to the pleasure they give. There is, besides, danger lest, by indulging too much the gratification of the palate, we should acquire a *false hunger*, which may urge us to eat when the stomach itself requires no supply, but is already loaded with food. Nothing is a more common cause of disorder, especially among young people, than giving way to a false appetite of this kind. It may be held for an undoubted rule, that whenever the desire of eating is not gratified by plain and common food, it is no real want, but the craving of a pampered and vitiated appetite.

But now to our proper subject. We will begin with mentioning what are the substances which afford proper sustenance to

man; and then consider the modes by which they are to be procured and prepared for use.

The two great divisions of food are into *vegetable* and *animal*. Man can subsist on either of these alone, but better on both together. Many other animals, likewise, can accommodate themselves to both sorts of food, though most of them, by choice, take to one alone. Thus it is usual to class beasts and birds under the heads of *carnivorous* (flesh-eaters), *herbivorous* (herb or grass-eaters), and *granivorous* (seed or grain-eaters). But as for man, he may be termed *omnivorous* (an all-eater); in which privilege no creature more shares with him than the hog. There has even been discovered a South-American tribe who lay the mineral kingdom under contribution, and fill their stomachs with a kind of unctuous earth, when no better provender can be obtained. They who judge by the teeth of an animal what food is most suitable to him, find that man partakes of all the three classes of living creatures above-mentioned; for he has the cutting and the piercing teeth of the carnivorous tribes, and

the grinders of the others; and can equally manage food of a soft and a hard texture.

Vegetable food is that which, in most countries, and especially those lying in the warmer latitudes, constitutes the far greater part of man's sustenance. It is nearest at hand, procurable in greatest quantity, and with most certainty; therefore the cheapest, and upon the whole the wholesomest. Of vegetables, by which I mean all kinds of plants, the earth is full, and the varieties of them seem to be endless. Almost all of them are food to some animals, and many more than is commonly imagined might be made to yield food to man. Different as they appear, the proper matter of food which they contain is nearly the same in many species, and may be classed under a few heads.

That vegetable substance which forms the chief supply of human aliment, and is found in the greater number of the articles commonly used for food, is called the *farina-ceous*, from *farina*, the Latin word for *meal*. This, in its separate state, is white, powdery, of little taste or smell, capable of swelling

with water and thickening it; and of being kneaded or worked into cakes. It contains a part called *starch*, which will dissolve in water, and make a jelly with it, as you have perhaps seen in the laundry; and it is this starchy part, which serves to stiffen linen, in which the nourishment of the meal chiefly consists. There is scarcely any vegetable which does not contain farinaceous matter in some part of it; but in many this portion is so small, and mixed with so much useless or hurtful matter, that they are unfit for human food. Men, therefore, have from the earliest times employed themselves in searching which of them yielded the most of this substance, and in the purest state; and they have usually made one or other of these vegetables the staple article of their diet, some of the principal varieties of which I will now mention to you.

Those grains which are called corn, and which are the seeds of certain plants of the grass-tribe, are the great source of farinaceous food in almost all the civilised countries of the globe. When we consider how tasteless these grains are, how little tempting to

the appetite ; and how small singly, even in a cultivated state, it seems almost unaccountable that they should ever have been selected for the main stay of human life. Hunger, however, is very inventive ; and it is not unlikely, that during some scarcity of game, or of the wild fruits of the earth, a starving tribe would have recourse to the tedious collection of these grains, prompted by the example of the smaller birds, whose natural food they are ; and that they would again abandon their use when the emergency was past. Such is now the practice of the savage tribes that roam over the shores of the Canadian lakes. The shallow margins of these waters are overgrown with an aquatic grass, called by botanists, *Zizania aquatica*, the seeds of which considerably resemble some small or stunted varieties of rice. Of these, the natives avail themselves in default of game or fish ; but only as an occasional supply, and never think of attempting its cultivation. So also, in cases of severe famine, which have occasionally occurred in this country, or on the Continent of Europe, some relief has been derived from

collecting the small seeds of one of our aquatic grasses, the *Festuca fluitans*, the sweet taste of which has gained them the name of *manna seeds*. It is certain, however, that none of the kinds of corn are now anywhere found as natural products of the earth; but are everywhere the reward of human industry. They must, indeed, originally have existed in a wild state; but it is countless ages since man has seized upon them for his use, and improved and multiplied their product by culture. You know that in the Bible, the oldest record of the history of mankind, mention is frequently made of corn, as the great article of sustenance, even amongst a pastoral people, rich in flocks of sheep and goats. Thus, when the family of the patriarch Jacob were reduced to distress by years of scarcity, they repaired to the fertile land of Egypt to purchase corn.

The kinds of grain usually grown in the temperate and colder climates are wheat, rye, barley and oats; in the warmer countries there are also rice, which feeds more human beings than any other article of diet what-

ever, maize or Indian corn, originally a native of America, millet, durrah, and some others. All these have a chaffy head, beset with a number of seeds, each enclosed in a separate husk. When they are detached from their husks, they are found to consist of a thinner skin, within which is a white substance or kernel, formed entirely of what, when reduced to powder, becomes farina or meal. Some of these grains are more palatable or more nourishing than others; but all are fit for man's food. They may be used whole, only taking off the husk or skin; and thus, you know, rice is commonly eaten, after being softened by boiling or baking. Shelled barley and oats, called groats, are sometimes used in the same manner. It has, however been more usual to grind them into a powder, more or less fine, and knead it into dough or paste, to be afterwards cooked; but the arts by which this is done will more properly be described hereafter.

Various other seeds contain enough of farinaceous matter to be useful as food. Of these are many of the leguminous or podded vegetables, such as beans, peas, kidney-beans, and

others of the kind. Their seeds, when ripe and dry, are very mealy, as I dare say you know, by the experience of pease-pudding to boiled pork. In seasons of scarcity, the bread of the poor has often been mixed with a proportion of bean- or pea-meal, which makes it coarser and less palatable, indeed, but not less nourishing. With us, however, these seeds are more commonly eaten in a green and unripe state; and they are the food of domestic animals when dry.

The chestnut is another seed abounding in farinaceous matter, so as to be one of the articles of which bread is made in the south of Europe. The chestnut in England seldom comes to maturity, and those brought to our tables are imported as a sort of delicacy. But in Spain there are whole forests of them, which afford the poor great part of their sustenance. The acorns of warm climates, too, are fit for human food; and the poets tell us that they were the first vegetable article made use of by man in his primitive state. They are, however, very indifferent diet; and it is justly reckoned to have been a great improvement, when the culture of corn was substi-

tuted, and man no longer “for his acorn meal, fought the rude tusky boar.”

Several fruits of the tropical countries yield farinaceous matter in abundance; but none is so remarkable in that respect as the bread-fruit, a product of the happy isles in the South Sea, which is said to have exactly the taste and appearance of the crumb of a new roll. By means of this kind gift of nature, a person, with the easy labour of planting a succession of these trees, may provide bread for his whole life, scarcely by “the sweat of his brow.”

The roots of plants are another copious source of farinaceous nutriment. Most of those which swell into a round form, called a *tuber*, or which run down straight and thick, contain a portion of this matter, though often mixed with juices of another kind. We have the happiness in this country of being well acquainted with, perhaps, the most valuable root of the farinaceous class that nature has produced — the potato. This plant, originally a native of North America, is said to have been first introduced into Europe by the celebrated Sir Walter Raleigh, who cul-

tivated it on his estate in Ireland; whence that country has longer enjoyed the benefit of it than Great Britain. No other root with which we are acquainted so nearly approaches to the quality of grain. A potato of the best sort, properly dressed, will break down into an almost perfect meal; and it may be made to yield a considerable quantity of starch, as pure as that from wheat. It likewise affords a vast increase upon culture, and, notwithstanding the disease to which it has of late years become liable, is still our best resource against scarcity. Some of our other garden roots, as turnips, carrots, and parsnips, owe their nourishing property in part to their farinaceous matter. In South America is a large root of this kind, the yam, which is often used in the West Indies as bread at table. A remarkable article of this class, is the cassava, or manioc root. One species of this, in its fresh state, contains an extremely virulent poison; but, by grating, washing, and drying, this hurtful part is got rid of, and the remainder is a fine white meal, often made into a kind of bread or biscuit. It also yields the substance called tapioca, sold in our shops

as an article of invalid diet. The plant is found wild both in the tropical parts of South America, where it is the principal vegetable food of the savage tribes dwelling along the shores and availing themselves of the inexhaustible fishy stores of the mighty river Maranon, and between the same latitudes of Africa. In many of the newly-explored countries of the interior of this vast continent, it is very largely employed. They commonly make it into a kind of gruel, which our travelling missionaries complain of as disgustingly insipid. It may indeed be thought extraordinary, that in regions basking under a tropical sun, and blest with soil of unrivalled fertility, the natives should content themselves with planting, as their sole regular crop, a root with nothing, seemingly, but its large returns and easy culture to recommend it. But to uninstructed human beings, scarcely raised above a mere animal condition, and enervated by the effects of excessive and unremitting heat, perfect idleness appears to be the enjoyment prized above all others; whilst Nature herself seems to have said, even to the tropical man, "If you choose

to live lazily, at least you shall not fare so
tuously on my gifts." How, by the progress
of the arts of civilisation, men have been
enabled to live both lazily and sumptuously
on the labour of others, is no part of
present subject. I leave it for your con-
sideration, and now bid you adieu.

LETTER III.

ON VEGETABLE ARTICLES OF FOOD.

MY DEAR BOY,—In my last letter I gave you a general account of the division of vegetable food, called the farinaceous. I now proceed to inform you what other matter in vegetables is nourishing to man.

The first that I shall mention cannot fail to afford us an agreeable topic. It is the sugary or saccharine principle, of which the juices of plants are the chief source.

The sensation of sweetness is naturally and essentially agreeable to the palate, as the colours of the rainbow are to the eye; so much so, that in all languages the term has been figuratively extended to a great variety of delightful qualities and actions; thus we speak of the sweetness of a hay-field, of a rose, or, in the words of Shakspeare, of the

"sweet music that breathes upon a bank of
violeta."

We also say a sweet wine, a sweet strain
of music, a sweetly coloured picture, and,
best of all, a sweet temper.

Sweetness is found both in animal and
mineral substances. Among others, we have
sugar of milk, and sugar of lead; but it is
from the juices of plants alone, either ex-
tracted by the labour of the bee, or prepared
by human art, that the saccharine matter is
procured in such purity and abundance as to
be collected as honey, or manufactured into
real sugar, and become an important article
of diet. Honey is obtained, as you are aware,
from the nectaries, or honey-cups of flowers;
but the quantity contained in each cup is so
small, that it is impossible to collect it by
hand, and it is of no benefit to us till it has
been rendered fit for our use by the labours
of the industrious bee.

That species of the insect called the honey
or hive bee, has been domesticated by man
from time immemorial, and supplied with a
dwelling; but wild honey is still procured
in considerable quantities in the forests of

Russia, where the bees form their combs in hollow trees; and in greater abundance in the western parts of the interior of Africa, where the hunter is often guided to their hoard by watching the motions of a small bird called the honey-buzzard. The history of honey-making is as follows:—The bee creeps into a flower, and sucks out, by means of its trunk, the sweet juice of the nectary, which it pours into its mouth and swallows. Part serves it for food, the rest passes into an enlargement of the gullet, which, when swelled out with honey, is about the size of a pea. When the bag is filled, the insect returns to the hive, and disgorges the contents into one of the six-sided waxen cells which form the comb. The cell, when full, is closed by a thin lid of wax. In *taking* the honey, after the bees have been stupefied by the fumes of sulphur, a slice is cut off each surface of the comb, so as to *unseal* the cells; after which it is laid on a sieve, to allow the honey to flow. The honey thus gained is the purest and best flavoured; but a further quantity is procured by pressing the pieces of the comb, which is defiled by the bodies

of any bee magots which have been crushed in their cells. Honey varies in colour, and still more in taste and other properties, according to the nature of the flowers from which it was gathered. On this account, the luxurious Romans, whom it served for sugar, caused their hives to be emptied of the more ordinary honey as soon as the blossoms of some particular plants, accounted to yield the very finest kind, began to unfold. This practice is also followed at present in some parts of European Russia, to obtain the pure product of the lime blossom, which is of a greenish-yellow colour, and of delicious flavour.

Poisonous honey has sometimes been met with, both on the southern shores of the Black Sea, and in America, which appears to have been produced by the flowers of some kinds of rhododendron, or azalia.

The value attached to this sweet by the Israelites may be judged of from the single expression of "a land flowing with milk and honey;" which places it on a level with the prime product of pastoral life. The introduction of sugar at once destroyed the im-

portance of this article of food, which, though containing much nutriment, is not wholesome by itself, except in very moderate quantities.

There are several trees the sap of which contains the saccharine principle in considerable quantity. Two of these, the sycamore and the birch, are natives of our own country, and although the juice is not so rich as to repay the expense of making it into a sugar, the sap of the birch, particularly, is fermented into a thin, but very palatable kind of wine. There is, however, a species of sycamore called the sugar-maple, which abounds in the south of Canada, and the northern parts of the United States, from the sap of which a considerable quantity of sugar is obtained sufficiently pure for domestic use. The operations of collecting and boiling down the juice give occasion to a kind of rustic festival, extremely picturesque from its situation and accompaniments, and celebrated with the heartfelt gaiety of country neighbours met together for mutual aid in a common pursuit. Some time before the breaking up of the frost, the farmers and their families assemble on the un-

cleared ground occupied by the maples, and forming a kind of encampment commence operations. First of all, a hole is bored in the trunk of each tree, to the depth of three inches; a stick is then placed in it, in a slanting direction, and a vessel is set below to receive the juice as it trickles down. In the meantime, boilers are fixed in a very rude kind of fireplaces, and the liquor, when enough has been collected, is boiled down to a third of its quantity. By some further operations this syrup is clarified, and brought, at length, into the state of soft brown sugar. It would be capable, by continuing the process, of being converted into loaf sugar; but for their own use, these people do not think it worth while to give themselves so much trouble. Their waggons are well stored with provisions and liquor, and the young people often conclude their labours with a dance.

The sap of most of the kinds of palm affords large quantities of a rich syrup, which is sometimes fermented into wine or vinegar, but oftener boiled down into an indifferent kind of moist sugar. In the time of the Romans, the juice of the date-palm was thus

treated in Judea, as it still is in Barbary. In the kingdom of Ava, our ambassador saw immense groves of the palmyra tree planted for the manufacture of sugar.

During our last war with France, when all the products of our colonies were excluded from that country by the policy of her ruler, its ingenious chemists suggested a substitute for the sugar of the West Indies in the juice of the white beet; a root of the same family with the parsnip. There were many practical difficulties to be surmounted in the manufacture, but their skill and perseverance were at length rewarded by the production of a fine loaf sugar, somewhat more expensive, it is said, in the preparation than the juice of the cane, and not quite so powerful a sweet, but inferior to it in no other respect. This culture was not abandoned at the return of peace; on the contrary, such has been its increase, that it now gives employment to thousands, and its produce has rendered France nearly independent of the western world for her vast consumption of this delicious sweet.

Sugar, peculiarly so called, unquestionably


came to us from the east, whence we are able to trace its progress step by step. Indeed its very name proves the fact. In the dialect of Bengal, one kind is called *shukkur* at the present day, and from its Arabic name *saccar*, its appellation in Greek, and in all the tongues of modern Europe, is evidently derived. White sugar-candy, but so dear as to be used only in medicine, was known in Arabia for several centuries before it was seen in any other form on this side of India. At length, we know not when or how, the cane itself was introduced into Arabia and Persia. Early in the tenth century it was cultivated about Ormuz in the Persian Gulf. From this point, doubtless, it was carried into Mesopotamia, celebrated for its excellent sugar at the time of the crusades. Hence it spread into Syria, and the Saracens carried it, in their course of conquest, to Egypt, Rhodes, Cyprus, Sicily, and the south of Spain. In 1420 the Portuguese introduced both the plant and the skill of preparing it into their newly-discovered island of Madeira, and transferred it thence to their colonies on the coast of Africa, and to Brazil. Hence its diffusion over all

Spanish America and the West India islands. In India, China, and Cochin China, the cane is cultivated, and sugar is prepared from it; in Java, and other East Indian islands, it is only used as a table vegetable, the stems being sucked or chewed raw. No plant abounds so much in saccharine juice as this, and hence its wide diffusion over the tropical and warmer temperate regions of the globe. The plant itself is a tall upright grass; and one of the few having a solid stem. From its simple woody root rise from one to seven or eight jointed stems, with a pair of leaves at each joint, and crowned with a bunch of chaffy flowers, but which produce no seed. There are several varieties of the sugar cane, which differ much in size and other properties.

The soft part of the cane, which is greedily devoured in all the countries where it grows, is exceedingly nourishing, as well as palatable; so much so, that even where it is prepared by negro slaves, notwithstanding the hardness of the labour imposed both on men and cattle during crop time, they all grow fat and strong upon the cane itself and its juice.

The jackal, likewise, and the wild dog rush in eagerly to claim a share in the general feast.

I shall not attempt to explain to you the means successively employed for the extraction, boiling down, and refining, of the juice. The last, especially, is a long, complicated, and delicate process, in which very great improvements have been made of late years, by the application of chemical science, and the power of steam. It is right, however, to mention, that the sugar manufactured in the east, is all either in the form of muscovada, that is moist, or powder, sugar, or of *khand*, sugar-candy as we call it. Loaf sugar is entirely a European improvement invented by the Venetians about the year 1500: hence the extraordinary value set upon this form of it for a long time afterwards. In the time of Queen Elizabeth, the University of Cambridge solemnly presented their chancellor, Lord Burleigh, with two sugar-loaves, among other gifts; and similar donations were long, if they be not still, customarily made by corporations of towns, and other public bodies, to judges, and great officers of state.



In our northern climate the sweet juices are chiefly met with in fruits; and those not native ones, but the foreign products of our gardens. Some of our eatable roots, however, also possess a degree of sweetness; as red beet, turnip, parsnip, carrot, and onion; not to mention liquorice, which is sweeter than any of these, but is scarcely an article of food. Even the farinaceous vegetables acquire a sweet taste when they *grow* or *germinate*; that is, when the rudiments of a new plant begin to sprout from them. This you may discover in a sprouted potato, or in grown corn. Malt, you know, is extremely sweet; at least, you may perhaps have tasted sweet-wort; an infusion of malt in water, from which beer is made by fermentation: but malt itself is only barley made to germinate artificially, by means of heat and moisture, and then suddenly dried. This shows a close connexion between the sweet and the farinaceous part in vegetables; and as the latter is nourishing, so is the former. You may take it as a general rule, that all sweet things afford nutriment; though I would not have you conclude that they are all fit

for food, at least without proper mixture with other articles. Fruits, with us, are rather used for the pleasure of the taste, and their cooling property, than for the purpose of nourishment; indeed, the acid or tart juice which they contain with the sweet, opposes their nourishing quality by its effects on the bowels. But in the hot countries, where fruits are often lusciously sweet, they are common articles of food. Grapes, especially in their dried state, when they are called raisins, are commonly used as such; and figs still more. The date, or fruit of the palm-tree, which is a rich sweet with little flavour, makes a large share of the diet of the people of Arabia and part of Africa.

If *drink* is to be reckoned a part of food, the class of vegetable sweets ranks high among the substances we are treating of, for it is the basis of all fermented liquors. *Fermentation* is an internal motion or working of a liquor, by which it throws off its thick and foul parts, and becomes clear and bright. All sweet things, when in a fluid state, if suffered to stand in a moderate degree of heat, undergo fermentation, by which they lose

great part of their original taste, and acquire a brisk tartness, very agreeable to the palate, and cheering to the stomach and spirits. It is then properly called a *wine*, though that name has been principally applied to the juice of the grape when brought to this state. But there are besides, you know, the *made wines*, as we call them, of raisins, currants, elder-berries, and various other fruits, to which some sugar is usually added. Then there is cider, or apple-wine; perry or pear-wine, and mead, or honey-wine; and, what in this country is used more than all the rest, malt-liquor, which may be termed barley-wine. To make this, the barley (as I have already mentioned) is rendered sweet by bringing on a sudden germination, which is called *malting* it; and the malt is steeped in hot water to extract its sweetness. It is a remarkable circumstance, that scarcely any nation, savage or civilised, has come within our knowledge, which had not found out the art of making some kind of fermented drink. This may seem an argument in favour of their usefulness; but I am apt to suspect that it has been their intoxicating quality, much

rather than their taste or other properties, which has rendered them such favourites. Could people be contented with the moderate use of them, they might be accounted a valuable addition to diet; but, abused as they are, it might almost be wished that pure water were the only drink known to mankind. The mischief has been made much greater by the discovery of the art, unknown to the ancients, of extracting the strongest part of these liquors separate, by means of distillation. The product is then called a *spirituous liquor*, or *ardent spirit*, and is, in reality, a kind of *liquid fire*, which destroys the reason, inflames the passions to a kind of madness, and consumes the vitals. Certainly, the preparation of this cannot properly be called one of the arts of life.

A much more innocent product of fermentation is vinegar; an acid into which any fermented liquor may be turned, by pushing the process of fermentation a degree further. In the wine-growing countries vinegar is obtained from wine which has turned sour, and other waste products of the vineyard. With us it is sometimes made at home of sugar and

water, or green gooseberries; but it is always manufactured in the large way of malt, previously made into a kind of ale without hops. It is cooling and refreshing, and is an agreeable condiment to salted meats and other articles of food, besides making a pickle in which both fish and vegetables are preserved for use.

All sweet things are apt to pall the appetite and to turn sour on the stomach, when they cause great disturbance within. They are particularly hurtful when taken in quantity upon a full meal, which is too often the case at desserts after dinner. Excess in them is the usual intemperance of young people, to whose palates they are particularly agreeable. Thus every pleasure offered by kind Nature is turned to a bane, if we have not sufficient self-command to use it with moderation. With this reflection I take my leave of you for the present.

LETTER IV.

ON VEGETABLE ARTICLES OF FOOD CONTINUED.

MY DEAR BOY,— I now proceed to another class of nutritious vegetable products, the oleaginous, or oily. A great number of seeds abound in a mild, tasteless oil, which though unfit for food by itself, adds greatly to the nourishing quality of the substance with which it is mixed. The kernels of several fruits contain this oil, and nuts of all kinds. The presence of oil may be known by mashing the substance and then pouring on water, which will become milky if oil makes a part of it. Almond milk, or emulsion, is made in this manner. The cocoa nut, the largest of the kind, which grows on a tall tree of the palm kind in the tropical countries, contains a natural milk, which is a mixture of its oily with its sweet and watery juices. From many oily vegetables, the oil

may be procured separate, by means of simple pressure. It is extracted thus from the fruit of the olive, which is the principal source of eating oil in Europe, and is much cultivated in its southern countries on that account, as well as for burning in lamps, and various other purposes. The tree is also grown in many parts of western Asia. "Wine and oil" are joined together, in the Jewish Scriptures, like "milk and honey." One of its uses was for anointing — a practice widely prevalent in the warmer countries of the globe.

The seeds of flax, hemp, rape, mustard, poppy, and several other plants, yield oils by pressure, of a similar kind, but less palatable; whence they are used rather for other purposes than for food. Chocolate, which is so great an article of diet in Spain and South America, and is a luxury with us, is a kind of solid oil or butter, procured from the nuts of the cacao. A lighter and more wholesome beverage is procured from these nuts by simply bruising and boiling them in water. Palm-oil, procured from the seeds of a plant growing in the hottest parts of Africa, is used by the natives for the purposes of butter. Of

late years we have imported it in vast quantities to be employed in candle-making. It is to be observed of the oily vegetables, particularly those of the nut kind, that they are in general difficult of digestion, and liable to do much harm, if eaten in large quantities.

Another tribe of vegetables are nutritious by virtue of the *mucilaginous* or slimy juices which they contain. You are probably acquainted with plum-tree and cherry-tree gum; and also with gum-arabic. These are pure mucilage, exuding from the tree, and hardened by the sun and air. It is seldom found in this separate state; but a portion of mucilaginous matter has been found in every vegetable which has been examined. Those juices which become sweet, oily, or farinaceous, in a mature state, are mucilaginous in an earlier period. Some plants, however, are particularly remarkable for their slimy nature, which they keep without changing. Such are mallow, marshmallow, comfrey-root, linseed, the seed of quinces, and many others. These give out their mucilage to water on boiling, and render it thick. They are articles of medicine rather than food; but it is

good to know, on occasion of scarcity, that gum, and all those vegetables, which, upon chewing, become slimy in the mouth, will afford an innocent nourishment. Some poor people, who dwell on the sea-shore, in cold countries, obtain food from certain kinds of sea-weed which abound in mucilage; and the Icelanders, in their inhospitable climate, derive great help from a kind of lichen or liver-wort, a leathery sort of substance growing on the ground, which yields a strong jelly when boiled in water or milk. It is imported into this country as a salubrious article of diet to the consumptive. But the most important by far of these mucilaginous products are gum-arabic and gum-Senegal, two substances very closely resembling each other in all respects. Gum-arabic was the first known in Europe; and Cairo and Alexandria were the principal marts for it, till the Dutch, about the beginning of the seventeenth century, introduced this gum into commerce from their settlements on the river Senegal, which now supply the greater part of our vast demand for this article, employed by us in calico

printing; and for many other manufacturing purposes. The tree which yields it, is a kind of thorny mimosa, growing abundantly on the sands along the whole of the Barbary coast. The trees are from eighteen to twenty feet high. Immediately after the heavy periodical rains, the gum is seen oozing spontaneously through the stem and branches, where it soon hardens in round lumps about the size of a partridge's egg. This harvest continues about six weeks. Besides the purposes for which it is exported, this gum also affords a very wholesome and nutritious food; thousands of the Moors live entirely upon it during the season of collecting it. Six ounces are accounted sufficient to support a man for a day. The caravans which cross the deserts of Arabia, with loads of gum-arabic, when in want of provisions, have sustained life for many days on this substance.

I believe I have now mentioned all the principal articles of vegetable food presented to us by nature. You see they are very numerous, and many of them easy to be procured, so that it would seem that there is

little danger of absolutely starving in a climate and soil where plants grow in profusion. But a mere casual supply would never provide for a considerable population; and is besides subject to much uncertainty and inconvenience. Human art, therefore, has in all countries employed certain methods to secure and improve these gifts of providence. What these are will make the subject of some of my future letters. But I will first take this opportunity to give you some account of a substance which, if not actually food itself, is the most general of all the condiments of food, one without which we should find our meals tasteless; and even disgusting. It also contributes largely to the support of mankind, by preserving articles of animal food for future use, which would otherwise be spoiled and wasted. You will perceive that I mean salt.

This substance is very extensively diffused over the globe, but like most other mineral substances, valuable to man, it is seldom supplied to him by nature in a state fit for his purposes, without some labour or skilful efforts of his own. It is found sometimes as

rock salt, which is its purest native condition, sometimes mingled in small particles in certain rocky beds, sometimes in salt-springs, and lastly in sea water. In order to procure it in a state of purity and dryness, it is necessary to dissolve it and subject it to certain processes, even where it is found solid; and where it exists as brine, to evaporate the liquor till the salt which it contains forms into crystals. In weak brine, this effect is assisted by dissolving in it portions of rock salt. It is obtained in many warm countries from sea water, evaporated by the heat of the sun, in shallow pools, called salt pans; and some is procured by this method in our own country; but our grand reservoir of it is in the salt springs of Cheshire and Worcestershire. From all these sources, we manufacture, annually, not less than half a million of tons, mostly of the best quality, in part for exportation, and in part for our immense home consumption. With this we season vast quantities of cheese; with this we pickle thousands of casks of pork and beef for the use of our navy and merchant ships; and with this we cure

myriads out of the vast shoals of pilchards and herrings, which every year swarm around our coasts, to make the *fasting diet* of all the Roman catholic nations of the south of Europe. From our salt, we likewise extract soda, for the use of soap-boilers and glass-makers; and a substance called chlorine, indispensable in the modern art of bleaching fabrics of linen and cotton.

From the intense craving for salt felt by all mankind, who have ever known the taste of it, and even by many animals, especially those of the ruminating class, it is to be supposed that to all these it is salutary in moderation; yet it is noxious, and even fatal to all life, animal or vegetable, when received in large quantities; and this was, perhaps, the reason that among the ancients it was made the very symbol of barrenness and destruction. When a city, overthrown by an enemy, had been sown with salt, it was understood that it was never to be rebuilt; but to lie devoted to perpetual solitude and desolation. At the same time, a kind of sacredness was always attached to this substance. By the Mosaic law, every “meat-

offering" was to be "seasoned with salt." The Greeks and Romans, in their sacrifices, always mingled it in the meal which they sprinkled between the horns of the victim. Among the Arabs, to eat bread and salt with a stranger, was to enter with him into the sacred bond of host and guest, which obliged each to protect the other at the hazard of his own life. "*The salt of the earth*," was probably an established metaphor to express the best and holiest of men; as *Attic salt* was the most exquisite seasoning of discourse or writing, wit of the most pungent kind. But I am perhaps digressing; and I hasten to conclude.

LETTER V.

ON AGRICULTURE.

MY DEAR BOY,—Perhaps you may have thought that I was detaining you too long on introductory topics, but it was proper, before we proceeded to Art, to lay a foundation in Nature, since it is she alone who, properly speaking, produces, and by whom the raw material must always be supplied, on which art of every kind is to operate.

I shall now, however, immediately proceed to describe the noblest art of all, and, no doubt, one of the earliest, that of agriculture, or the cultivation of the soil. In this I include gardening, or hand-culture, since it is in this primitive form alone that it is still practised in those parts of the world where, as in the interior of Africa, and among the north American Indians, men are found in the rudest stages of social life. The simplest

tools, a hoe, a dibble, a kind of spade, commonly of wood, would suffice for raising the requirements of a scanty population, of which too it was not the sole support, when wielded by the labour of female hands: for, amongst all savages, it is on this over-burdened, oppressed, and ill-requited race of slaves that their masters have constantly devolved all the hard work of their domestic life.

As numbers increased, other agricultural resources would be sought out, and it may very probably have been the conception of a plough which first suggested the happy thought of calling in the quadruped subjects of lordly man as fellow-workers in his various occupations.

The sturdy ox has been in most countries the chief labourer in drawing the plough; if slower and somewhat less tractable, he is usually cheaper to maintain than the horse.

Other animals, however, are occasionally put to this service; I think it was in China that a traveller beheld an ass, a sow, and an old woman, yoked to the same plough; but this, we will hope, must have been on an emergency.

These services of the patient ox are beautifully recited by the poet Ovid, in the person of the humane philosopher Pythagoras, as a plea for exempting him from being slaughtered for human food, in lines which may be thus translated. "How has the harmless ox deserved to die; plain, simple creature, void of fraud or guile? Ungrateful indeed is he and unworthy of the gift of corn, who can endure to slay his rustic servant; to smite with the axe, that neck, worn bare as it is with labour, and but just relieved from the weight of the curved plough, which has so often renewed the stubborn glebe, and earned for him so many harvests."

I call this art the *noblest*, because it is the most useful of any, and that which is the foundation of all the rest; for where plenty of food is produced, man will infallibly multiply, and will employ his inventive faculties to supply his other wants; but scarcity of food acts as a deadly disease upon society; it breaks the spirit, while it weakens the bodily frame; extinguishes hope, and cramps every exertion. The Chinese have been so sensible of this truth, that they have considered every

thing else as subordinate to the culture of the land, and, though abundantly ingenious in many other arts, hold them all mean in comparison with that. In order to do it honour, the emperor himself, surrounded with all his great officers of state, on a certain day of the year ploughs a piece of ground with his own hand, and sows it with grain; the produce of which is carefully collected, and its quantity registered, as one of the most important events of the year.


The business of agriculture consists in the selecting of such vegetables as are useful for the purposes of life; freeing them from the incumbrance of weeds; promoting their growth by a proper working of the soil, by the use of manure, and by all the other means which experience has found serviceable to that end; and, finally, gathering them in their due season. I shall mention all these different operations in their order; taking *gardening* as a part of agriculture.

The choice of the article to be cultivated depends upon such a previous knowledge of the nature of vegetables as I have attempted to give you in my former letters, and also

upon the experience of their suitableness to different soils and situations. Supposing this determined, the next thing is to prepare the ground for its reception. In order to allow plants to strike root freely, the soil must be loosened and broken into small particles, and at the same time cleared from the useless plants, or weeds, already growing upon it. Hence, the plough and the spade are the first instruments of agriculture. The plough, by means of its share or coulter, cuts through and turns up the soil which it is drawn over. It buries the upper surface with the weeds, and brings up fresh mould from below. The weeds, thus uprooted and turned under, die and rot, and serve to enrich the land; while the earth brought to the top is exposed to the action of the sun and air, the dew, rain, and snow, which serves to fertilise it, and render it soft and mellow. Ploughing is repeated several times in stubborn soils; and after it has done its work, comes the harrow, which, with its iron teeth, still further breaks the clods. Heavy rollers are also sometimes drawn over, to complete the operation. Where the land is of a spongy nature, and

over-abounding in moisture, it is necessary to drain it before it is tilled. This is done by cutting trenches through it in several directions, and covering them over with flat stones or sods, or laying earthen pipes along them.

Little needs be said as to the necessity of fencing cultivated land against the inroads of cattle, or other plunderers. This is done either by ditches, banks, rails, and stone walls, or by live hedges of strong and prickly shrubs. It is chiefly owing to the frequency of green hedges, interspersed with trees, in the enclosures of England, that its prospects are so peculiarly rich to the eye. Hedges have the bad property of harbouring a great number of small birds and vermin, which prey upon the grain; but in return they break the force of the storms, and yield faggot-wood for fuel; and the little birds, all of them insect-eaters in part, make good amends for their pilferings by the vast number of slugs and of caterpillars, and other noxious insects which they devour; to say nothing of their songs and their beauty, which so enliven the rural scene.



Before countries were fully peopled, while land was yet plentiful, it was the custom to select those portions of it which were naturally best adapted to the purposes of agriculture, and to leave the rest in a wild and uncultivated state, such as we still see it in the heaths and commons which are scattered through even the finest parts of England. The better sort of soil was then trusted to its own fertility, and nothing was bestowed on it but the kind of tillage above described. When it no longer yielded such an increase as to make it worth while to expend labour and seed upon it, the land was considered as tired, or exhausted, and was left to repose, and to recruit itself by the influence of the elements. This practice was called *fallowing*; and by its means tolerable crops of grain were obtained about two years in three. But in process of time, land becoming more valuable, it was desirable both to force it to bear without any interval of rest, and to bring into some kind of cultivation even the poor and refuse parts which had before been neglected. This could only be effected by the use of *manure*, the proper application of

which has become one of the most important points in the art of husbandry.

Manures are of many kinds, and are employed with various intentions. In the larger way they are used to change the very substance and staple of the soil. Thus, lands consisting of mere sand are improved by the mixture of a large proportion of *marl*, a kind of earth, the ingredients of which are clay and calcareous earth. This binds the particles of the sand together, and prevents its being dispersed by the wind, or burnt up by the sun. It enables it to hold more moisture, and thereby gives a stronger support and a richer nutriment to the roots of plants. A field well marled will retain its superior fertility for a number of years. Stiff clayey soils, on the other hand, are improved by the addition of *lime*, which loosens their texture, and corrects the coldness they acquire from imbibing too much water. No one kind of earth pure and unmixed is well fitted for the purposes of husbandry, and the best soils are composed of a mixture of all.

Most manures, however, are substances possessing a fertilising quality in themselves,

and proper for almost any kind of soil. It is a very beautiful provision in nature, that matters the most noisome and offensive, and which we should most wish to remove out of the reach of our senses, are the most efficacious in bestowing fertility upon the earth. Putrid animals and vegetables, every thing oily and greasy, the sweepings of streets, soot, ashes, the scourings of drains and ditches,—all, in short, that we call filth, refuse, and offal, impurities which would infect the air if not removed, when thrown on the land, are returned to us in the finest verdure, and the richest vegetable products. You must learn that not a particle of matter can ever by any possibility perish, or be annihilated; but that its atoms are in a constant state of motion and change; shifting through innumerable forms, making part now of organised beings, animal or vegetable, now of the general mass of rude matter lying in perpetual readiness to enter into these new compounds. Every situation affords to the observant husbandman some fresh materials for his purpose. In places remote from the resources offered by towns, with

their markets and stables, he sometimes, if near the coast, spreads upon his land heaps of fishes thrown up by the tide. Sea-weed, and even the mud of the shore, impregnated with salt water, prove valuable to him as manures. Salt itself, though formerly made, as I have observed, the very emblem of barrenness, is found, in a due proportion, to operate powerfully in forcing the growth of vegetables; and not only sea-salt but every thing of a saline nature, has this property. Thus, the ashes of burnt vegetables, which yield the alkaline salt called soda, are employed as a manure; and it is a common practice to pare off the turf of barren soils, and, piling it in small heaps, to set them on fire, after which the ashes are spread over the land. In countries where many sheep are kept, arable land is much improved by folding these animals by night successively over it, when it becomes enriched by the oily droppings from their fleeces, and what else they leave behind.

It is to manure that gardeners are particularly indebted for the abundance and luxuriance of their products. The rich garden-


mould, indeed, is almost entirely composed of rotted vegetables, the relics of long cultivation. By the constant application of composts, the gardens in the neighbourhood of London are enabled to yield that prodigious supply of vegetables which such a city requires: for no sooner is one crop gathered, than the ground is prepared for the reception of another; and thus every season of the year, scarcely excepting the dead time of winter, has its peculiar harvests. Similar management gives to the grass-fields round London that verdure, so grateful to the eye, which neither the burning suns of July, nor the pinching frosts of January, can destroy. It is thus by the art, and we may now add, the science, of the cultivators of the field and the garden, which has nowhere been carried to a higher pitch than in this island, that we support in plenty our vast population where half the numbers of ignorant and lazy barbarians would die of hunger.

It has been said, that he is truest patriot who makes two blades of grass grow where only one grew before; if so, we may reckon our patriots by thousands. With this encouraging remark, I now take my leave.

LETTER VI.

AGRICULTURE CONTINUED.

MY DEAR BOY, — Before I say more on the operations of husbandry, it may be proper to remark, that in the hot countries water is considered as the most valuable of all manures, and a great share of the skill of the husbandman is employed in procuring a due supply of it. Plants, it is found, will grow luxuriantly in water alone, if aided by a suitable degree of warmth; and in almost every climate, rank vegetation accompanies the course of brooks and rivers, and the moisture of marshes. You have probably read of the fertility bestowed upon Egypt by the annual inundation of its great river, the Nile, which stands to it instead of all other dressings for the land, and even of the rain from heaven. That country, in reality, is only a long narrow slip of culti-



vated land on the banks of the Nile, bounded on each side by rocks and sandy deserts. The Ganges, and various other rivers which take their rise from high mountains, are subject to similar periodical floods at the melting of the snow, of which the inhabitants make their advantage, by drawing off the water through trenches and canals to the distant grounds. Many are the contrivances in Persia, China, and other thirsty countries of the East, for throwing up water from the channels of rivers and ponds, to the higher lands. Without these, the heat of the sun would soon wither every green thing, and the country would be rendered a barren waste. To this state those fine valleys have in fact been reduced, which in ancient times nourished the great and magnificent cities of Nineveh and Babylon. Through the effects of foreign conquest and ignorant and oppressive government, the country has become quite impoverished: in consequence, aqueducts have gone to ruin, canals have been suffered to run dry, wells have become choked up, the people have dwindled away for want of the means of subsistence, and a country

which was once cultivated like a garden, is now little better than a wilderness. In our part of the world, the frequency of rains throughout the year causes these cares to be for the most part unnecessary; yet the practice of occasionally flooding grass fields has been adopted with great success in several places, and as rich a vegetation has been obtained as could have been produced by any compost.

A preparatory operation to the culture of land, which is now seldom necessary in this country, is the clearing it of wood. This is the first business in forming settlements in the western wilds of North America; and so stubborn a piece of work it is, that to a resident in that part of the world, the idea of a *cleared* country is almost the same with that of a cultivated one. It is generally reckoned too great a labour at first to dig up the large trees by the roots; but after the underwood is cleared away, they are stript of their branches, and then *girdled*, as they call it, which consists in cutting a circle of bark round the trunk, whereby it is made gradually to decay. This, however, is but a

slovenly method, and only excusable for want of hands.

We will now suppose the ground fully prepared for receiving whatever the husbandman chooses to entrust to its bosom. A variety of objects present themselves to his choice, of which I shall only notice the principal. The vegetable selected for cultivation may be classed under the heads of "1st, food for man; 2dly, food for animals; 3dly, materials for clothing and other economical purposes." I have already spoken generally of the articles of man's vegetable food, and shall now say something of their culture.

Of the four kinds of grain raised in this country, two, namely wheat and rye, are called *winter-corn*, because they are usually sown in the autumn, and stand through the winter. The other two, barley and oats, are called *spring-corn*, not being sown till that season. The cause of this difference is, that the two first strike deeper roots, and require a longer time to come to maturity than the last. Of these grains wheat is by much the most valuable, and is peculiarly the food of man, for whose use it is reserved. It yields

the purest meal, the greatest quantity of starch, and makes the whitest and most palatable bread. It requires, however, a better soil and climate than the others; and there are some parts of this island, particularly the mountainous and the more northern, where it cannot be grown to advantage. The soil best suited to it is a strong loam, or one which, by a large proportion of clay, is rendered of a fat and tenacious quality. As it greatly exhausts the fertility of the earth, it is reckoned bad husbandry to sow it two years together on the same spot, except in some remarkably rich soils, or with abundance of manure. Several kinds of wheat are cultivated, differing in colour, size, and fineness of the grain, and suited to different soils. The red wheat, which is the most common, gives to our fields that peculiar richness of hue which prevails about harvest. Wheat is the farmer's pride: the wheat-sheaf is the emblem of plenty; and the wheaten garland was the ancient decoration of Ceres, the goddess of plenty.

Rye, though considerably resembling wheat, is a much inferior grain. Little of it, com-

paratively, is grown in this island; but in some countries it is the principal bread-corn of the poor, though the bread made from it is black and clammy. It suits northern climates, as it has the advantage of ripening early. It is the tallest kind of corn; and therefore affords a great deal of straw.

Barley is next to wheat in value; and in old times a mixture of equal parts of the two, called meslin, formed the common household bread of the country. In later times, a barley bread, called jannock, was often used in the frugal north of England. But the chief use of this grain, if not now the only one in our country, is for the making of malt liquors. I have already told you that malt is barley brought to a beginning state of germination. The immense quantity of these liquors consumed among us under the names of beer, ale, and porter; and unappily, the vast distilleries of gin or malt-spirits, render barley a very important article of cultivation, as well as of import. Much of it is also used in the fattening of oxen, hogs, and poultry. Barley will grow upon lighter and poorer soils than wheat, and is more

commonly produced upon high grounds. Its quality, however, is much improved by warmth and manure. It is a grain of some of the warmest climates, and is the principal food of horses in Arabia, Persia, and the other countries of the East. Its silvery hue when ripe, and the glossy softness of its beards, give great beauty to a field of barley waving in the wind. A coarser kind of it, called bear or bigg, is grown in Scotland, and much used or abused rather, in making the spirituous liquor called whiskey.

Oats are a still inferior grain, and may be considered as the corn of cold and wet countries. Before the improvements in agriculture, which have made such a wonderful progress within the present century, the northern part of England, Wales and all Scotland used to be fed almost entirely with oatmeal: and still in the last country, oatmeal porridge is a great part of the diet of the lower classes. The chief use of oats in England, however, is for the food of horses; and so much has the number of those animals, whether kept for use or luxury, increased of late years, that it is necessary to

import great quantities of this grain from abroad, in addition to the home growth. Oats will grow upon wet and moorish soils, where other corn would fail. Great quantities are now raised in Ireland. The finest in this island are produced in the fenny country of Cambridgeshire and Lincolnshire.

Corn is the great object of culture to the farmer on arable land, or that subjected to the plough: and his skill is principally shown in suiting the kinds of grain to his various soils, and in establishing a proper rotation or round of crops, so that none of his land may become exhausted by the continued bearing of the same kind. The old practice of letting land lie fallow in order to recover itself, is now entirely disused by farmers in enclosed fields; instead of which roots and *green crops*, such as turnips, clover, tares, vetches, and others, are interposed between the crops of grain. By their means the ground never lies a whole year idle; but is always employed for the support either of man or beast. I shall say more of these articles when I have done with those products which make part of the food of man.

The *leguminous* or *podded vegetables* are less used for that purpose in this country than in many others. Beans, peas, and kidney-beans, when grown for the table, are generally cultivated in gardens; and are used while green. We cultivate, indeed, large quantities of field-beans, but they are commonly eaten by horses and hogs. They grow best in strong soils, such as are suitable for wheat. They are sown in the spring, and do not ripen till the very end of harvest. The grateful odour of a bean-field is well known to all who take country walks at the season of their blossoming. They scent the air for miles together in those districts where they are principally grown. On the other hand, the blackness of the pods and stalks when they are ripe is very unpleasant to the eye. But the farmer, who finds them a very profitable crop, does not concern himself with such trifles.

Field-peas are also sown in the spring. They are earlier ripe than beans, and thrive on lighter soils. The sort called white peas form an article of human food, especially of *sailors*, who eat them boiled with their salt

pork. The gray peas are principally the food of hogs.

Potatoes are now cultivated in the large way in most parts of this island, and take their turn with other crops. They are reckoned to be of the best quality on light sandy soils: they will, however, thrive in almost any soil deep enough for their roots, and sufficiently manured. There is no way in which ground can be employed in these climates so profitably to the production of human food, as in the culture of potatoes. The quantity of a good crop is prodigious; by many times exceeding the weight of any crop of grain on the same space. By perfecting their growth under ground they are little exposed to injury from the weather; —a peculiar advantage in a wet climate. The calamitous experience, however, of poor Ireland several years ago, when an entirely new disease attacking this root produced a direful famine, and consequent pestilence, has proved the imprudence of trusting to this, or indeed any single article of culture, for the entire support of a people. Potatoes are used for the food of other animals

as well as man ; they do not however answer well without previous boiling.

But I have now, I believe, given you as much provision as you can digest at once : so farewell !

LETTER VII.

AGRICULTURE CONTINUED.

LET us now examine, my dear boy, what man has done more particularly for the sustenance of those animals which he has made, as it were, part of his household. It cannot be pretended that he has the merit of disinterested kindness in this matter; yet things are so ordered, that, by consulting his own good, he in reality promotes that of the creatures which he has taken under his dominion. They are in general better fed, better defended from the inclemencies of the weather and from their natural enemies, in his keeping, than in a state of nature; greater numbers of them, too, are produced; and when the quantity of labour which he bestows upon them is considered, he may be reckoned fairly to have purchased the advantages which he derives from them.

Of the leguminous plants cultivated solely for the use of cattle, are clover or trefoil of various kinds, vetches or tares, sainfoin, lucerne, and some others. Clover is frequently sown along with corn, so that, when the corn is cut, a field covered with this plant remains. It is a rich nutriment for all domestic animals; and they are so fond of it, that, when suffered to eat it green in the field at their pleasure, they are liable to burst from the quantity they devour, which ferments and swells in their stomachs. So you see that it is not men alone who are subject to indulge their appetites to a hurtful excess; and that *living in clover* is a dangerous condition to all creatures. Clover hay is a strong food for working cattle. Two crops of it are generally mown in the year, and it is a valuable article in the farmer's list. The delightful fragrance of the white, or Dutch, clover you are perhaps acquainted with. Vetches are often mown early in the year for green fodder, and the land is then laid down for some other crop. Lucerne will give several successive green crops in the season. Sainfoin is reckoned particularly

suitable to thin chalky soils, and it is dried for hay.

The turnip forms a very important article in the improved system of husbandry. This plant, you know, produces a root of remarkable size and roundness, consisting of a very white firm substance, of a sweetish taste. When cultivated in gardens it is one of our table vegetables, and I dare say you are acquainted with its merit as a companion to boiled beef and mutton. The field turnips are mostly of the same kind, but some of them, of a Swedish variety, are more hardy than the other and are grown solely as food for cattle. They thrive best in a light soil; and instead of impoverishing the ground, they excellently prepare it for crops of grain. By their means some of the poorest sandy soils have been brought into culture, and made to yield valuable crops of barley and oats. They are frequently sown as soon as ever the corn is carried off the land, with the intention of using them as the winter and spring food of cattle when all other forage is scarce; and thus the farmer is enabled to maintain a much larger flock of animals than

he could otherwise do. Turnip-fields greatly enliven a country to the eye by their vivid green, at a time when the land in general wears the sad hue of the declining year; but they are not equally agreeable to the other senses, since they have a rankness of flavour which infects the air, and which may be perceived in the milk and flesh of the animals fed upon them. In this case, as in many others, the necessities of a large community cause quality to be sacrificed to quantity. These roots are either eaten upon the spot where they grow, or pulled up and given in the fold or yard. Sheep and oxen both feed readily upon them, and acquire great dexterity in scooping out the heart and leaving the rind.

Other vegetables which have got from the garden to the field as the food of animals, are cabbages, coleworts, carrots, beets and parsnips. All these in certain soils answer well, and make a useful variety of cultivation.

But the principal article on which domestic animals are nourished is grass: that which constitutes the verdant carpet spread spontaneously by nature's hand over the surface

of the earth. Of grasses there are almost numberless species, which grow intermixed, and are adapted to all soils, from the marsh to the mountain. Farmers in general do not trouble themselves to select particular kinds of grass for their meadows and pastures, but trust to nature to cover them with the sorts proper to the soil and situation. Yet when land is changed from arable to pasture, and the seeds of grass are designedly sown upon it, care should be taken to choose the best sorts, as free as possible from weeds. A species called ray-grass is a favourite in some places, on account of the height to which it grows early in the year; but it is hard and coarse. It is not uncommon to mix a proportion of white clover seeds with those of grass, by which the ground becomes well covered at the surface.

Grass is either eaten on the place, which is called *pasturage*, or it is left untouched to the time of its full growth, and then mown, dried in the field, and made into *hay*. Though grass in drying loses great part of its juices, yet it retains its nourishing properties and is improved in its fragrance. The smell


of new hay, you know, is one of the most grateful odours; and when well preserved, it retains its sweetness a long time. The process of hay-making consists in the thorough drying of the grass when cut, and it should be performed with as much expedition as possible. For this purpose it is spread abroad to the action of the sun and wind, frequently turned over, and formed into little heaps or cocks to protect it from showers and the night dew. As the season in which hay is made, the middle of summer, is subject to violent rains, it is an anxious time for the farmer, who often sees his crop completely wetted when just fit to carry, and has all the business of spreading, turning, and making into cocks to go over again, to the great addition of expense, and injury of the product. Negligence and delay are surer of their punishment in this than in most country work; and "to make hay while the sun shines" has long been a proverbial precept. If, however, the hay is carried in too much haste, before it is sufficiently dry, it is apt to heat so much in the ricks as to take fire; and there are few *years* in which such accidents do not happen.

In some parts of England, especially in the well-manured fields of Middlesex, two crops of hay are got in the year; but, more commonly, farmers are content with a single crop, and the field is employed for the remainder of the year as pasture.

As for the fields which are constantly pastured, the only attention paid to them is to remove the cattle from one to another as the grass is eaten down, and give it time to shoot up again. Low rich grounds by the side of streams, especially where subject to occasional floods, can scarcely be more profitably employed than by being left in grass. The expense of culture is small, and the product, whether hay or green fodder, is valuable. All the dairy farming for the production of cheese and butter depends chiefly upon grass; for none of the artificial foods for cattle yield milk so sweet and pure as the natural grasses. The short turf of mountains and high downs is the favourite pasture of sheep, who thrive upon it better than upon richer herbage. Large tracts in this island are left in a state of nature to serve as *sheep-walks*, which is

probably the best use to which they can be applied.

What nature has done by means of grass for the sustenance of animals, is seen to perfection in the vast meadows, or savannahs, as they are called, which border the great rivers in the southern parts of America. These are covered with prodigious herds of wild oxen, the parents of which escaped from the Spanish colonists who first settled in the country, and multiplied in these luxuriant pastures, where the warmth and moisture of the climate afford a perpetual growth of herbage, both summer and winter. Along with them are numbers of buffaloes, and of deer of various species, the original inhabitants of the country. Here the grass grows to such a length as almost to conceal the tall animals which feed in it, and it is frequently fired by the hunters to force them from their retreats. A remarkable instance of the quick increase of the grazing animals in unstinted pasturage occurred a few years after the first settlement of New South Wales. A party sent to explore the interior of the country, discovered in a green sequestered valley a herd of near a hundred



cows and calves feeding, protected by a large and very ferocious bull. As no animals of this species are natives of that part of the world, they must have been the progeny of a pair of horned cattle belonging to the settlers, which had rambled away about seven years before. There are now multitudes of these cattle, wholly wild, which roam at large in many parts of the colony, and occupy the most inaccessible places, being totally distinct in their habits from the half-wild herds to which they or their parents originally belonged.

I think I may now close my account of such articles of food for man and animals as in our island are objects of agriculture. I might, indeed, take further notice of some products used in *drink*; as apples and pears, which afford cyder and perry, the common beverage in some counties; and hops, an ingredient in malt liquor, largely cultivated in various parts of the kingdom: but it does not come within my plan to enter into these particulars. For the same reason, I shall forbear to enumerate the products of the garden, and the several methods of culture

practised in it, both of which are so extremely various, that large books have been written of them alone. It is enough in general to observe, that the additions made to our diet by the art of gardening have tended to render it both more pleasant and more salubrious. The garden vegetables, whether eaten raw, as salads, or boiled as greens and roots, are the best correcters of strong and salt animal food, and effectually prevent that dreadful disease, the scurvy, which proves so destructive to seamen, and to those on shore who live on the same kind of provision. In reading accounts of long voyages you will be struck with the eager longings for fresh vegetables of any kind shown by the poor sailors. For their use, gardens are cultivated at all places where they touch in their course; and navigators have been attentive to sow garden-seeds plentifully on all the uninhabited shores and islands they have visited, that those whom chance should afterwards bring to the same spots might find necessary refreshments.

A garden is an appendage of civilised life: it decorates the palace and cheers the cottage. A very small piece of ground cultivated as a

garden will afford essential support to a poor family; and it is to be wished that no labourer's house in the country were unprovided with this benefit. By the help of cabbages, onions, kidney-beans, lettuces, and others, many a scanty meal might be improved; common fruits might be raised for home use or for sale, and the employment of a few leisure hours or holidays would be sufficient to add materially to the comfort of the year.

But it is time to conclude my letter.
Adieu!

LETTER VIII.

ON ANIMAL FOOD, AND THE MEANS OF
PROCURING IT.


MY DEAR BOY,— Having thus long kept you, like an ancient Pythagorean or modern Brahmin, solely upon vegetable food, I now proceed to mend your diet by adding to it that large supply of human sustenance which is derived from the animal creation. As I am convinced that man has as good a right to kill beasts for his food, as they have to kill one another, I shall not attempt to spoil your appetite by interesting your compassion in favour of the victims, or dwelling upon the cruelty of a butcher's shop. You may find some very pretty lines to the purpose in the poet Thomson, who, however, could eat his beef-steak with as good a relish as any man. Treat animals kindly while they live, and never take away their lives wantonly

or by methods unnecessarily painful; but you need not scruple to make that use of their bodies which the Creator has plainly ordained.

Although I have supposed that the earliest food of man was of the vegetable kind, yet there are several situations in which we can conceive him placed, which would rather prompt him to seek his first sustenance from the animal tribes; and even at this day, in various parts of the globe, he is only a hunter or a fisher. In the midst of vast forests abounding with game, but scantily provided with eatable vegetables, men have become a kind of beasts of prey; and their appetites have been entirely carnivorous. On the inhospitable shores of the frigid regions, where the rigours of the climate deny any other product of the earth than a little coarse grass, and a few stunted herbs, the human native through necessity looks to the fertility of the sea to compensate the barrenness of the land, or climbs the naked rocks, often at great hazard to his life, to collect the eggs and young deposited there by those fowls which are fishers like himself.


There is scarcely any quadruped, bird or fish, upon which man cannot occasionally feed ; but he usually prefers those whose flesh is tender, and free from any peculiar rankness of flavour. The part in which the principal nourishment consists is the muscular flesh ; the fat is chiefly useful by keeping up the animal heat. Other parts, however, besides the muscles, even the bones themselves, may be made to yield abundance of a nourishing jelly by long boiling in a tightly closed vessel.

It would be an endless task to describe all the modes which the ingenuity of man has invented for catching wild animals, nor could I, by words alone, make many of them intelligible ; we will, however, take a general view of the principal. Being less swift than the greater part of the objects of his pursuit, he has been obliged to have recourse either to missile weapons, by which he might arrest them in their flight, or to traps and snares to detain them. No savages have been discovered so void of art, as not to have adopted contrivances of both these kinds. The missile weapons have generally been




the bow and arrow, the dart and the sling. With all these I suppose you are acquainted, and probably you have yourself been a manufacturer of bows and arrows. Armed with these, the hunter places himself in ambush, and strikes at the passing game: or he steals upon them unawares as they feed, crawling on the ground, or concealing his approach behind the stuffed skin of some harmless animal, which figure is usually called a stalking-horse. The range of these weapons however, is trifling, compared with that of fire-arms, which have taken place of them wherever they could be procured. Thus, guns are the most favourite articles of barter between savage tribes and the white traders who visit them. By their means the bird is brought down from the summit of the loftiest tree, or is even stopped in his rapid flight; nor does the fleet antelope or bounding chamois escape the ball of the sportsman from his distant station. The deadly force and sure aim of these arms have even emboldened the hunter to attack in the open plain the huge elephant and the formidable rhinoceros.

But greater numbers of wild animals, and of shyer natures, are caught by the contrivances of snares. In constructing these, extraordinary ingenuity has been displayed by some of the most untutored nations, thus showing what the human faculties are capable of when earnestly applied to any one object. By their means, the terrible lion is made a captive to man, as well as the crafty fox or timid hare. Birds are frequently taken in nets, in which they are entangled by various artifices: some of their own species are often trained to assist in the fraud, and they seem to take a malicious pleasure in decoying their companions to the snares into which themselves have fallen. Fishes, inhabiting an element in which they cannot be followed, are caught either by the allurements of baited hooks, or by nets spread to intercept their course. Some of the larger species are struck while swimming, with a dart or harpoon skilfully launched from a boat. The spearing of salmon by torchlight in a Scotch river, has been strikingly described in the novel of *Guy Mannering*, as I dare say you remember.



The old voyager, Dampier, has given a very curious account of a tribe of men whose art in taking their animal prey is truly extraordinary. They are called the Moskito Indians, and are natives of part of that neck of land which separates North from South America. These people are brought up from their infancy to throw the lance or harpoon with great exactness, in order to fit them for their principal employment, which is that of striking fish, sea-tortoises, and manati. For their dexterity they are much valued by the crews of ships frequenting those parts, who give them great encouragement to come on board; and it is said that a couple of them in a ship will provide subsistence for a hundred men. They bring with them their little canoes, in which they regularly dispose all their tackle, and they will not suffer any other person to get into them. Indeed, any European sailor would be in danger of immediately oversetting them. With these they put out just at their pleasure, for they will bear no control; and they seldom fail of success. "I have known (says Dampier) two Moskito men every day for a week bring

aboard two manatees, the least of which has not weighed less than 600 lbs." They are also equally dexterous in killing game in the woods, so that they are well able to subsist themselves in any situation. The same writer gives an entertaining relation of a Moskito Indian, who being left accidentally on the island of Juan Fernandez, lived there alone for three years, till he was brought away by the ship to which Dampier belonged. He was left with a gun and a knife, a small horn of powder and a few shot; which being spent, he contrived a way, by notching his knife, to saw the barrel of his gun into small pieces; with which he made harpoons, lances, hooks, and a long knife. These he forged, by heating in a fire, and then hammering out and bending by means of stones; after which, he gave them a proper temper, and ground them to an edge by long labour. By the help of these instruments he procured such provisions as the island afforded, either goats or fish; and was in perfect health and vigour at the time they found him. It was on this adventure perhaps that the story of Robinson Crusoe was founded.



These *arts of life*, however, when they form the employment of a whole people, denote a state of society little advanced in civilisation. The hunter-tribes, spread over a vast tract of country, and living much in solitude, have small opportunity of improvement from mutual intercourse. They resemble the animals which live upon the same prey with themselves; and when not engaged in the chase, they either make war upon each other, or spend their time in absolute indolence. Their supply of food, likewise, is always precarious; sometimes abundant beyond their wants, at other times so scanty as to reduce them to the extremities of famine. At present, families of men solely dependent on the chase or on fishing, are found only on the American continent within the arctic circle, and in Australia. In Asia, none such are mentioned, even in the earliest records we possess. But the ancient Germans were some of them found in the pure hunter state by the Romans, of whose manners Tacitus has left us a full and very interesting description. The women however of most of these tribes either collect berries, dig up roots, or raise a

few vegetables from which some relief to famine may be obtained.

A great advance from this condition of mankind is the *shepherd-* or *pastoral-state*. Certain animals seem formed by nature to be domesticated by man and live under his protection, which they repay by a regular supply of his necessities. From the earliest times we read of tribes which have wandered over extensive regions, driving their flocks and herds from pasture to pasture, fed by their milk and flesh, and clothed with their hides and fleeces. This was the life led by the ancient patriarch in the plains of Mesopotamia, by the Scythians, Arabs, and Numidians; and at this day it is exactly followed by the Bedoweens of Asia and Africa, and the numerous hordes of Tartars. The animals selected for domestication have been the sheep, the goat, the ox or beeve kind, the camel, and the reindeer. The Tartars join the horse to their other pastoral wealth, and not only as a beast of burden, but as affording a choice aliment from its milk and blood. Such a kind of life will not admit of fixed dwellings. The shepherd people have there-

fore always inhabited tents, or huts placed upon wheels, with which they have constructed moveable towns or villages, wherever the change of pasturage led them. By living together they have acquired more civilisation than the hunters, though less than the cultivators of the land, who are builders of houses and found temples to their gods.

These pastoral nations are now, however, comparatively few and inconsiderable, and absolutely extinct on the continent of Europe; and the rearing of domestic animals is a part of the regular business of farmers in every country, their flesh and other products being in general use. In our island the quadrupeds bred for food are chiefly the ox, the sheep, and the hog. Goats are kept in flocks only in some few of the mountainous parts of Wales and Scotland. Deer are confined to gentlemen's parks, and considered only as objects of luxury. Rabbits in a warren can hardly be said to be under the dominion of man, though first placed there and occasionally fed by him, but great numbers are now reared in confinement, and regularly fattened for the market.

One of the articles of food yielded by the

domestic animals deserves particular notice, as it has long been an object of rustic art. This is *milk*, a liquor prepared by nature in the females of all the warm-blooded quadrupeds for the sustenance of their young; but which man, who applies to his own use every thing that he finds suitable to his occasions, has converted into an aliment for himself. It is of a middle quality between animal and vegetable; and indeed partakes so much of the latter, that the gentle tribes which reject all animal food seldom scruple the use of milk. It is the milk of the herbivorous animals alone which enters into human diet; and the cow, as the largest and most productive of the kind, is the species commonly preferred for the dairy. In many countries, indeed, and in the northern parts of this island, sheep and goats also are milked; and the milk of the ass is used as a medicinal article of nourishment; but cow's milk is the staple upon which this kind of food depends. This liquid is so quickly and copiously separated from the fluids of the animal, that it retains many of the properties of the vegetables on which it feeds. What a delicious draught is milk

fresh from a cow just returned from a pasture abounding in fine grass and wild flowers! To an unvitiated palate none of the artificial products of fermentation are comparable to it.

Milk is good either as nature yields it, or boiled and mixed with bread and other farinaceous substances. After standing awhile, it throws up a thick scum called *cream*, which, by brisk agitation, is mostly converted into the solid oil so much used in our diet under the name of *butter*. The instrument by which this is made is a churn, and a proper degree of heat assists the process. Fresh butter is one of the most grateful of oily or unctuous substances; and, when not used in too great quantity, is a wholesome article of food. The residue, called *butter-milk*, which contains the cheesy part of such milk as has been taken up with the cream, is a very nourishing and refreshing liquor. It has usually an acid taste, extremely grateful to those early accustomed to it. In our northern counties it is the ordinary drink of the agricultural population, who would be indignant to see, as is constantly the case in

- the south of England, the hog-trough filled with what might serve to give plumpness to the cottage child and fresh vigour to the half-fed labourer. Milk contains also a mucilaginous part, which separates after the coagulation or curdling of the fluid. It forms a white solid matter called curd, which, pressed and salted, becomes *cheese*, the other most important preparation from milk. It is a strong and hearty diet for working people, and a delicacy at the tables of the rich.
- There is a wonderful variety in cheeses as to taste and other qualities, considering that all are prepared from one simple substance, and the manufacture of them is one of the principal arts of the rural housewife. In this country many pasturing districts are almost entirely devoted to its production, the demand for it being very considerable, both for home consumption and for exportation to our colonies. We also bring it in large quantities from Holland and the United States; and the rich Parmesan from Lombardy. The *whey* or watery part, which constitutes the chief bulk of the milk, holds a proportion of sugary matter dissolved in it, and soon turns

sour. When fresh, it is a pleasant cooling drink; but most of it also falls to the share of the hogs. I omitted to mention that the curdling of the milk is promoted by adding a little of a liquor called rennet, which is made by steeping a piece of the inside skin of a calf's stomach in warm water. Dairy-women keep by them these skins salted and dried for use.

The flesh of the domestic animals commonly employed for food in this part of the world, is that of the ox and the sheep, called beef and mutton; of the same animals while young, called veal and lamb; and of the hog, called pork. Goats' flesh, from its rankness, is seldom eaten but from necessity, and in hot climates where the sheep does not greatly thrive, but that of the kid is nearly as good as lamb. The above go under the name of butchers' meat, and are in constant use at the tables of those who can afford it. They are all wholesome when joined with a due proportion of vegetables. Where it is requisite to keep them long, as in sea voyages, salt is applied in large quantity; but the meat is thereby rendered less salubrious

and nourishing. Pork, and next to it beef, take salt the best, and may be preserved the longest.

Besides these quadrupeds, some birds have been rendered domestic; and agreeably vary man's animal food. Those selected for this purpose are the poultry kind, of which are the common cock, the turkey, peacock, and guinea-fowl: pigeons, both the wild and tame; and some of the aquatics, as ducks and geese. These are reared at little cost by the farmer, in whose yard and fields they pick up what would otherwise be lost; and their delicacy renders them a valuable object of profit. But the fattening of poultry for the London market is now made a separate branch of trade.

Fishes may be said in some measure to be domesticated by the practice of storing ponds with them, whence they may be taken at pleasure. But in this way they are regarded only as articles of luxury, like the venison of the park, and the game of the cover. Fish, as an article of common food, is taken from the sea or rivers; and sometimes so abundantly as to form the principal subsistence of

the neighbouring people. It is, however, a less nourishing, and even less wholesome food than flesh, and among all the tribes of mankind, none have been found existing in a lower and more destitute state, than those whose whole reliance is on the uncertain produce of the ocean. As forming a portion only of diet, it is a very valuable and agreeable auxiliary, and fisheries have been in all ages objects of importance to the inhabitants of shores and islands. I have already adverted to the quantities of herrings and pilchards, which our native stores of salt enable us to secure; but I now shall add a few additional particulars to your information on this subject. Fishing nets are among the inventions of time immemorial, and are employed even by very uncivilised nations. There are two principal kinds of them, the *casting-net* and the *drag-net*, or *seine*. The first, is that which the fisherman stationed on a rock or hillock, on the sea beach or the river's brink, *casts* or throws, over his shoulder in such a manner as to make it fall in a circular form, and sinking to the bottom by means of stones or lumps of lead fastened to it, it

entangles the natives of the shallow waters. The drag-net is adapted for the deep-sea fishing. That employed in our Cornish pilchard fishery is often of the surprising dimensions of three hundred fathoms in length and seventeen fathoms in breadth. As soon as those set to watch on the cliffs discern the approach of the mighty shoal, which they distinguish by the change it produces in the colour of the sea itself, the net is carried out in a boat by two men, who drop it so as to surround a portion of the prodigious multitude. By means of leads below and corks above, it is kept in an upright position, brushing against the bottom of the sea. The boat is then moored, and the fish are bailed out. One haul has been known to yield as many as three millions of fish; yet the multitude scarcely seems diminished. Herrings are taken in a similar manner, off Yarmouth in Norfolk. These fish, after being opened and cleaned, are some of them pickled only in brine; others, after lying awhile in salt, are run through the gills with twigs, and hung up in long rows over the smoke of wood-fires, and thus dried

and made into what are called *red-herrings*. Another fish, the mackarel, is taken in a similar manner off our coasts, but not in equal quantities, for it is of too delicate a nature to bear curing or long carriage, and will therefore only serve for the immediate use of the neighbouring inhabitants. The salmon is another valuable capture made by the net, chiefly off the ports of Scotland and our northern counties. What are brought to our tables under the name of *salt fish*, are cod and some kindred species, taken off the island of Newfoundland and there cured; but these are not entangled in a net; but vast as is their multitude, each fish is separately caught by one of a number of hooks suspended by long rows of lines.

But I fear I have tired you with the length of my letter; so adieu.

LETTER IX.

ON THE PREPARATION OF FOOD.

MY DEAR BOY,—Having now laid before you a very abundant supply of provision, it is time to consider how it is to be used. This is a care which does not concern other animals, who take their food in the state in which nature has presented it to them; but man has scarcely ever been found so savage, as not to have employed some mode of preparing the articles of his food, so as to render them more wholesome and agreeable than in their raw state. In fact, he has sometimes been called by distinction, *the cooking animal*. Hence, we may fairly reckon cookery among the arts of life; for though it has been abused to the purposes of voluptuousness, yet in its principles it is founded on just considerations of health and economy. If it be requisite to ennoble it, as some have done by the title

of science, it may be regarded as belonging to physic in its intention and chemistry in its practice. I do not propose, however, to enter further into its mysteries than to give you a notion of some of its simplest operations. The kitchen is a kind of prohibited place to our sex, as most young gentlemen have had occasion to learn; and I should be sorry to see you a proficient in the accomplishment, upon which some young men of fashion seem to pride themselves, of *talking cookery* in all the terms of the modern *cuisine*. When deprived of their natural helpmates, indeed, men are made practitioners of this art by necessity, and soldiers and sailors frequently become very skilful in it, while French men-cooks stand, as we all know, at the head of their profession. But with the ministers of luxury we have here no concern.

Before proceeding further, however, some preliminary matters must be treated of.

I have already described to you the primitive mode of adapting farinaceous seeds for human food, by simply rubbing off the husks and parching them, sometimes in a green,

THE ARTS OF LIFE.

metimes in a mature state. But to reduce them to powder, make them into a paste with water, and then bake them has also been a practice of high antiquity. This mode has many advantages over the former. It produces a more convenient article for the food of every day, whether eaten alone, or combined with flesh or milk; and there are several kinds of corn which cannot be treated in the simpler method. Among these are barley, oats, and rice itself, all of which are protected by a hard chaffy, or horny, inner covering, adhering so closely to the seeds as not to be separated either by rubbing or beating with sticks. These it was the primitive method to knock in a wooden mortar, by which the husks were torn off without breaking the grains. Afterwards the same process was employed to reduce all kinds of grain to powder, for the purpose of making bread or cakes of it. Wooden mortars were long the only implements so used by the Romans and to this day, rice, which is eaten whole is shelled thus in many parts of India. Hand-mills, however, date farther back than any historical record. This invention v

a first step in the progress of mechanical contrivance for this important purpose; and it was long before a second was made. The Israelites seem never to have known any other kind, and even at present the Arabians and Syrians, though not entirely destitute of cattle-mills, worked by oxen or asses, or even water-mills, in some of their largest towns, seem in general to persevere in their old custom of grinding their corn at home, thus making it a daily portion of domestic occupation. A laborious and an irksome one it is, and one which has therefore always been laid upon the weaker sex. In common families it falls to the lot of the wives and daughters, whilst in more wealthy households it was imposed on female slaves, and where they were numerous, on the lowest even of these; sometimes indeed, a male slave, who had offended his master, was threatened with *the mill* as a dreadful punishment.* Hand-mills were well known in Egypt, for the scriptural historian indicates the extremes of high and low condition by the pathetic expression, "From Pharaoh that sitteth on his throne, to the maid-servant.

THE ARTS OF LIFE.

It is behind the mill." The prophet likewise in denouncing the uttermost depth of misery and degradation about to fall on a woe-stricken city, exclaims, "Virgin daughter of Babylon, thou shalt no longer be called tender and delicate; sit in the dust, take the mill-stones and grind meal." Thus too, Samson, when fettered, blinded, and a captive, was set to grind in the prison house.

Homer, the earliest Greek writer we possess, makes mention of bread in all the banquets he so carefully describes, and in the *Odyssey*, that most entertaining of poems, which makes us so completely at home in ancient life and manners, the King of Phœacia is said to have fifty women-servants, many of whom are employed in turning the corn-mill. Ulysses himself is represented as the owner of twelve mills, worked by as many female slaves, grinding wheat and barley with great labour.

In these islands a similar mill, called a *quern*, was in use for many ages. Shakespeare speaks of "labouring in the quern" and in the Western Islands of Scotland the machine was scarcely out of use a hundred years ago. It was always worked by a

women. With us, however, happily, every lord of a manor was obliged by law to build a mill—worked no doubt either by wind or water—and all his tenants were obliged to take their corn to be ground at it. We ought to praise and greatly to rejoice in that progress of humanising civilisation which first removed this heavy yoke from the necks of women to lay it on those of the ox, the ass, and the horse; and afterwards transferred it to those free helpmates of man, the water-fall and the winds; and last of all, to the expansive force of steam.

The first notice we have of water-mills, refers to their introduction at Rome about the time of Pompey's victory over Mithridates King of Pontus, by whom it is obscurely hinted that one had been set up. Antipater, a Greek poet of that day, celebrated this excellent invention in a beautiful little poem, of which the following is a translation:—

“Cease your work, ye maidens who laboured in the mill, sleep now, and let the birds sing to the ruddy morning, for Ceres has commanded the water nymphs to perform your task. Obedient to her call, they throw themselves on the wheel, force round the axle, and thus turn the heavy millstone.”

It is not known when or where wind-mills were invented, but the Chronicle of Bohemia mentions them as common in that country before the year 728; and they were certainly employed in France at an early period. This invention is applicable to dry and especially to flat countries, where there are no streams with fall sufficient to turn a wheel.

The operation of grinding corn in mills is performed by means of two round flat stones, of a hard quality, the upper of which turns upon the under, which is fixed. They are set at such a distance as just to admit between them the grains of corn, which are poured through a hole from above. These are partly crushed, partly cut by the edges of scores made in the mill-stones, and at length brought to a meal, more or less fine according to the space left between the stones. The whirling motion at the same time throws the meal to the outer part of the stones, where it is received in a circular box, and carried downwards through a trough. It then passes through sieves of different fineness, which separate the bran and the other skinny parts *from the pure flour*. The degree in which

this separation is effected makes the difference in flour as to whiteness and fineness. In wind-mills the motion is imparted by the force of the wind acting upon sails, in water-mills by a current of water pushing against boards which are fastened to a wheel. Many of these, especially the water-mills, are very curious machines, of great power and complicated contrivance, in which the operations of drawing up the sacks of corn, emptying them, grinding, sifting, and the rest, are performed with wonderful ease and regularity, without any help of men's hands. Steam-mills are a farther advance even on these, and still higher examples of mechanical science, applied to purposes of practical utility.

We shall next proceed to the art of cookery itself; but I must first give you some respite,
so

Farewell.

LETTER X.

COOKERY.

MY DEAR BOY,—All cookery depends upon the application of heat either dry, or through the medium of water or steam. It is an universal effect of heat to expand the substance to which it is applied, and thereby render it more easy to be dissolved or broken down. Such, indeed, is the power of heat, that scarcely any substance can sustain a high degree of it, without that separation of its parts which destroys its form, and which chemists term decomposition. It is evident, therefore, that heat must prepare food for being digested in the stomach. It likewise heightens the taste of various things, corrects their rawness, and makes them more agreeable to the palate. In some instances it dissipates noxious parts, and converts a natural poison into wholesome nutriment. Of

the methods of applying heat, the simplest is exposing the subject to a naked fire; and this must be the only one practised by those nations which have not discovered any material that can hold water and at the same time bear the fire. Thus, the natives of the South Sea Islands, when first visited by our navigators, had not the least notion of boiling water, and were much surprised at being scalded by putting their hands into a kettle.

The effect of dry heat is, I dare say, familiar to you in the school-boy cookery of roasting an apple or a potato. You would perceive that in both these cases it softens and breaks down the firm pulp of the substance, causes it to shrink in bulk by expelling part of its moisture, improves the taste, and in the potato, corrects that earthy flavour which is disagreeable in the raw root. Toasting, baking, and roasting are different processes of this kind. In baking, the heat is confined in a close place, and applied equally and regularly. I shall speak particularly of the principal article cooked in this way, which is *bread*.

The simplest manner of preparing meal

or flour for eating, is by making it into cakes with water alone. Wheaten flour is thus made into ship-biscuit, which is rendered so hard and dry by baking, that it will keep sound for a great length of time. Oat-cakes are made in the same manner, and are usually baked over the fire upon a flat stone or iron plate. But, from the earliest times, civilised nations have had the practice of converting corn into what is properly named *bread*. This is done by mixing the flour with a *ferment* or *leaven*, and working it up in a proper quantity of water (generally with the addition of salt) into a soft paste, or dough, which when set in a warm place, acquires an intestine motion, and heaves or rises. It is then made into loaves, and put into the oven. By baking, the loaves become covered with a firm crust, including a soft spongy crumb. The superiority of bread over biscuit or unleavened cakes consists in its being more tasteful, more easily chewed, and lighter to the stomach. The ferment employed is, in this country, almost universally, that scum which arises to the top of malt liquors when fermenting, and is called *barm* or *yeast*.

most other countries it is a piece of the dough itself, suffered to grow sour; and this is what particularly bears the name of *leaven*. It is very material to the making of good light bread, that the ferment should be thoroughly mixed with the dough, and the whole mass well *kneaded*, by which means “a little leaven leaveneth the whole lump.”

Having thus instructed you in the important art of bread-making, I shall not descend to the consideration of puddings, pies, and pastry, the invention of luxury, but proceed to other matters of plain cooking.

The application of dry heat was, doubtless, the original cookery of animal food; and Homer's heroes are represented as very expert at cutting up a sheep or a porker, and broiling steaks upon the coals. With the cleanly intervention of a gridiron, this is still one of the most favourite kinds of cookery; and few delicacies are so grateful to a true English palate as a tender beef-steak done *secundum artem* at a chop-house. Frying in a pan is in some respects an improvement on this process, as it protects the meat from the smoke and flame, and preserves the fat.

But since neither of these methods would succeed with a whole animal or a large joint, it was a bright invention to run a spit through the subject, and turn it round and round before the fire. This contrivance, from the gradual and equal application of the heat, has somewhat of the effect of baking; and being practised in the open air, it avoids a kind of disagreeable taint which meat is apt to get in the oven. Various devices have been adopted to make the spit go, without stationing a poor boy where he is half-roasted himself in turning it, or a little dog, called a turnspit, as was once the custom. The jack has obtained the final preference, set in motion either by means of a weight which turns an axle as it descends, or by flyers placed in the chimney, and turned round by the air rushing upwards, which last is usually called a smoke-jack. Roasting is much practised in England, where we love to bring large joints to table; but it wastes much of the juices of the meat, and consumes a great deal of fuel. All the applications of dry heat make animal food more savoury by imparting a degree of burnt flavour (called by chemists *emphyreuma*) to

its oils, and exalting or rendering more pungent its salts. At the same time it is made more stimulating, and less fit for delicate constitutions and weak stomachs.

The use of water in cookery is very extensive. The roots and green parts of vegetables are commonly boiled, by which their substance is made tender, and the crude unpleasant taste of many of them is corrected. Several kinds of vegetables, such as the whole cabbage tribe, would not be eatable without boiling. I have known boys make themselves seriously ill by eating raw turnips and carrots, which lay undigested on their stomachs, whereas by boiling they become perfectly wholesome. Water poured boiling hot upon certain herbs extracts their flavour and other properties, and thus affords an article either of diet or medicine. Many herbs, both wild and cultivated, have been employed among us from early times, for one or other of these purposes. Such are dandelion, ground ivy, nettle tops, succory, marsh-mallow, and horehound, with several of the aromatics, as balm, mint, and sage. Some of these infusions are still in popular use, and we now give them the general name of *teas*,

however true that in the Chinese land, of which, in nearly two centuries past, we have imported such prodigious quantities, and which we now regard almost as a necessary of life, like the Chinese themselves.

This warm beverage, which cheers the spirits without intoxicating, is found equally acceptable to persons of all ages, conditions, and habits of life — to the hardy sea-boy and the sickly student, the full-fed and luxurious lady, and the half-starved needlewoman and toiling laundress. It solaces alike the fatigues of the traveller, whether shivering amid arctic snows or fainting beneath the suns of the tropics. Nothing has so much promoted habits of temperance amongst us, as this welcome substitute for fermented drinks. Tea partakes of the properties of a narcotic; and the finer kinds, when taken strong and in considerable quantity, are therefore capable of hurting the nerves. Moderation is requisite in all things; but on the whole no one can doubt that it is one of the best boons bestowed upon us by our world-wide commerce.

Coffee, the fruit of a shrub indigenous in Arabia and Abyssinia, but now largely culti-

vated and drunk both in the East and in the Western hemispheres, whither it was carried by the Portuguese, is almost as acceptable to us as tea itself; and far more in request on the continent of Europe. Its chemical nature is said to be very nearly identical with that of tea.

Animal flesh boiled in water becomes thoroughly penetrated with the heat, without any of the effects of burning. It is therefore milder than roasted or broiled meat, and is on that account fitter for weak and delicate persons. But the action of the water robs it of some of its nutritious juices, and, if long continued, renders it quite tasteless and void of nourishment. This property of water is the foundation of a very useful kind of cookery, that of making broths or soups, which contain all the nutritive portions of animal substances, without the gross and useless parts. They have generally the addition of some of the aromatic or strong flavoured herbs, and some culinary roots, and are often thickened with farinaceous matters. It is perhaps the highest exploit of cookery, as an useful art, to produce these agreeable

and salubrious mixtures of animal and vegetable substances, in which every thing employed to the greatest advantage in economical view, and the palate and digest are equally consulted.

The use of condiments or seasonings food, though much abused to the purposes of luxury and intemperate gratification, has however, a place in simple cookery. I have already given you some account of some of the principal of these articles, which I have seen nations who have been acquainted with them have failed to employ in some manner in their diet. The people of Otaheite were found to have the practice of setting by in a vessel of sea-water, into which they dipped each morsel before swallowing it. Even sheep and cattle, whether in a wild or tame state show a great fondness for salt, and will lick lumps of it with great relish. A small portion of salt is supposed to assist the dissolution of food in the stomach, besides giving a taste to things of themselves insipid. The warm aromatic vegetables, such as mustard, horse radish, pepper, and other spices, are useful in correcting the cold and win-

nature of certain foods, and impart vigour to the stomach. It seems extraordinary that the natives of the hottest climates are most fond of spices, which they mix in such quantities with their food, as would absolutely fire the mouth and throat of one unaccustomed to them. This is owing to the relaxing power of heat, which renders the strongest stimulants necessary to rouse the languid organs to exertion. The Greenlander and Samoiede, on the other hand, think train oil, of which they can procure ample supplies from the marine animals around them, the finest of all sauces to their dried fish or flesh, and are able to digest a full meal of whale's fat. Oily matters have besides the very valuable property to the inhabitants of the frigid zone, of serving as a kind of fuel, by which the animal heat is supported, and the flame of life kept in, as it were, both in the human species and in those creatures which, like the Greenland bear, lay themselves up for the winter in a torpid state.

Thus wisely does providence suit its gifts to the several necessities of all its children!

Adieu.

LETTER XI.

ON THE ARTS RELATIVE TO CLOTHING.

MY DEAR BOY,—I am now to introduce you to another division of the arts of life, the necessity of which you will not question—those by which man provides himself with that covering for his body with which nature has omitted to furnish him. This necessity, indeed, is less universal than that for procuring food, since there are climates in which clothing is scarcely requisite, except as far as the purposes of decency demand. Within the tropics, the black colour of the natives, and the natural oiliness of their skins, increased by the use of unguents and paint, sufficiently protect them against the ordinary inclemencies of the weather. Yet even in those countries the practice of going entirely unclothed is extremely rare, and where it exists is the sign of a state little advanced beyond the savage ;

and some kind of apparel is usually worn by the superior classes as a mark of distinction. In all the cold and temperate parts of the globe, the want of clothing begins at the instant of birth, and seems one of the most urgent. Yet such is the power of accommodating himself to all temperatures and all circumstances, in which man has been made to excel his fellow denizens of earth, that a tribe of savages almost totally destitute of clothing has lately been observed on the coast of Terra del Fuego ; one of the rudest climates of the whole world, being nearly an incessant alternation of storm, rain, frost, and fog. Their dwellings, if so they may be called, are nothing more than a few boughs bent into a kind of arbour, and nature herself seems to have denied them every material for clothing. Their dreary and unproductive forests are so destitute of living creatures, that they have no knowledge of any quadruped capable of supplying them with a fur cloak ; the fish which form their sole sustenance yield them nothing of this kind, and they have not found means to avail themselves of the bark of trees or even of their leaves. Canoes and fishing

tackle seem their sole possessions ; they contrive however to exist,—wretchedly no doubt.

The first covering to the body in warm climates may probably have been the large leaves of trees fastened together by the fibres of the same ; but this must have been so slight and little durable, as soon to be set aside for better contrivances. To interweave the long and narrow leaves of plants of the grass or reed tribe in the form of a mat would be a pretty obvious expedient ; and to this day we find that some savage tribes have proceeded no further. Yet, simple as this contrivance may seem, it is the origin of the art of weaving. A kind of clothing still more simple probably occurred to the inhabitants of colder countries, namely the skins of slain animals, those very coverings bestowed by nature upon them, and denied to man. The savage hunter who had killed a bear, at the same time made a display of his prowess and enjoyed the reward of it, by wrapping round him the shaggy spoils of his game. You have read, perhaps, of the lion's skin of the renowned Hercules, which, with his club, are all the accessories usually given

by painters and sculptors to this ancient hero. At this day, a sheep's skin, with the fleece outwards in summer, and inwards in winter, forms the principal garment of many northern people; in fact, such clothing is by no means a strange sight among the peasantry who bring their goods to the markets of Petersburg or Moscow. I have read too of a very simple and compendious mode of clothing a young Tartar, by throwing over his shoulders, the raw hide of a horse, and shaping it to his body with a pair of shears. Clothing, as well as food, may therefore be divided into the vegetable and animal; and I shall follow this order in the account I am going to give you of the several materials of dress in use among more civilised nations.

The *vegetable* matters employed for this purpose are chiefly of two kinds; the fibres of various parts of plants, and the downy substance in which the seeds are sometimes imbedded. The fibrous, or stringy texture, is very prevalent in vegetables. *Woody* fibres, as they are called, are found not in the wood alone; they abound in the bark also, and form the skeleton of the leaf supporting

the soft parts, and giving suppleness and elasticity to the whole. These fibres are nearly straight, united here and there with the adjacent ones, or fastened together in bundles. Some lie parallel to each other, some obliquely, so as to form a kind of network. It is principally from the bark, whether of trees, shrubs, or annual plants, that we obtain our supplies of this substance, which is adapted to various uses, partly according to its fineness and toughness, and partly according as the straight or crossing direction of the single fibres renders it easy or difficult to draw them out in separate threads. Bark is sometimes used just as nature gives it, with no other preparation than cutting it in separate strips. That of the lime tree in this state, serves the peasantry of Poland and European Russia to plait into sandals, or summer shoes, which they fasten on with a string made of twisted willow twig. Common bass-mats are woven from the same material, stripped of its outer skin. In Jamaica and other West Indian islands, there grows a tree called the Lughetto or Lace-bark tree, on account of the beauti-

ful net-work formed by its crossing fibres, which can easily be split into slices so thin, as greatly to resemble the real lace. Various articles are made of it. Thick pieces are cut into trowsers, which are stout enough to bear washing. The ingenious, though but half-civilised natives of Otaheite and other isles of the Pacific, when first discovered by Europeans, were found to have invented a very simple method of making clothing sufficient for their happy climate, from the fibrous bark of two of their native trees, the bread fruit and the paper mulberry. The bark taken off the tree in as large flakes as could be got, was laid on a flat stone, or a piece of wood moistened with water, and stretched out by beating with a wooden bat. The pieces were easily joined by making the edges overlap and giving them a few blows with the bat, the bark when wet being slightly glutinous. These, however, are but poor materials for clothing in comparison with those yielded by plants the parallel fibres of which are capable of being completely separated from the matter which held them together; made into clean, loose,

bundles, and thus fitted for the processes of spinning and weaving. Two plants, hemp and flax, have been employed for this purpose in Europe and the countries adjacent, from the earliest records to the present day.

It appears from the Mosaic law, that linen, as well as woollen cloth, formed part of the dress of the Israelites when they left Egypt, and the priests, when on service at least, were clad wholly in linen. Herodotus records the same of the Egyptian priests: Egyptian mummies too are always found wrapped in linen bandages. The Babylonians, according to Herodotus, wore under garments of linen. In those countries flax is no doubt, indigenous. In ancient Greece and ancient Rome it is certain that the men wore nothing but woollen; but there is some reason to believe, that both the Grecian and the Roman ladies adopted the cleanly luxury of linen, long before their husbands and brothers. It has often been repeated that Augustus, when master of the Roman world, had not a shirt to his back; yet it is known, that in his time linen of very fine quality was made at Taraco in Spain. It was also manu-

factured in the whole of Gaul, as well as in Germany, and the women of those countries regarded no material of dress as equally beautiful and becoming with this.

Flax, in latin *linum*, whence the word *linen*, is an annual plant rising on a single stalk to a moderate height, and crowned with handsome blue flowers, succeeded by globular seed-vessels. It is cultivated more or less in most of the countries of Europe, and succeeds best in a strong loamy soil, with a good deal of moisture. It is suffered to grow till the seeds are ripe, and is then plucked up by the hand, laid in little bundles to dry, deprived of its seed-vessels, and put into pits of water to rot. The purpose of this part of the process is to dissolve a gummy or mucilaginous matter which holds the fibres together. It is the most disagreeable thing belonging to the management of flax, since the smell arising from it while rotting is extremely offensive, and injurious to the health, and the infected water is apt to kill the fish which swim in it. When the flax has lain long enough, it is taken out, washed, dried, then beaten with mallets, combed, and by various

other operations so prepared, that the long fibres are got by themselves, clean and loose, in which state they are shining, soft to the touch, yet strong. It is this which the manufacturers call *flax*: the shorter and coarser fibres separated by the comb are called *tow*. The staple of flax is longer or shorter, coarser or finer, according to the soil in which it is grown, and the methods used in dressing it. Where a very fine thread is desired, the seed is sown extremely thick, which makes the plant grow up weak and spindling, with a fibre proportionally thin. The operation of spinning, which it next undergoes, consists in drawing out with the fingers several of the fibres together, and twisting them. This was originally done by means of a long stick, called a rock, or distaff, on which the flax was fastened, and which was stuck in the girdle, while one hand of the spinner was occupied in drawing out and twisting the thread, and the other in winding it upon a reel, or spindle. But this method gave way to the use of a simple machine called a spinning wheel, in which the twisting and *winding* are performed by means of a wheel

turned by a treadle. Spinning, both of flax and of wool, has been part of the domestic occupation of women from the earliest ages. The spinning wheel was a pleasing object in cottage scenery and often celebrated by the poets—thus Rogers in his “Wish :”—

“ And Lucy at her wheel shall sing,
In russet gown and apron blue.”

Thus charmingly, too, has Wordsworth placed it amid the family group of “the homely priest of Ennerdale :”

“ It was a July evening, and he sate
Upon the long stone seat beneath the eaves
Of his old cottage, as it chanced, that day,
Employed in winter's work. Upon the stone
His wife sate near him, teasing matted wool,
While, from the twin cards toothed with glittering
wire,
He fed the spindle of his youngest child,
Who turned her large round wheel in the open air
With back and forward steps.” . . .

It would certainly be desirable that some branches of manufacture could still be preserved in a simple state, which might thus fill up the vacant hours of rural life, and offer some reward to the humble industry of the domestic hearth. We may therefore be allowed a little to regret that the unremitting

application of new and complicated machinery in gigantic factories, to all our manufacturing requirements, should at length so totally have superseded this primitive labour, that a spinning wheel has become an object of antiquarian curiosity. The product of flax-spinning is thread, which is more or less fine according to the nature of the material and the pains employed. Some, closer twisted than the rest, is kept for needlework ; the rest is made up in bundles called linen yarn, and committed to the weaver.

I know not how, by verbal description, to give you any clear ideas of that common engine, the loom ; and you may learn more from five minutes' observation in a weaver's shop, should a hand-loom weaver be still to be met with, than all my pains in writing can teach you. A few words to give you a general notion of this important, venerable, and almost world-wide art may, however, not be thrown away. I have already told you that weaving may be regarded as a finer kind of matting. To perform it, the threads which form the length of a piece of cloth are first *disposed* in order, and strained by weights

to a proper tightness; and this is called the *warp*. These threads are divided, by an instrument called a reed, into two sets, each composed of every other thread; and while, by the working of a treadle, each set is thrown alternately up and down, the cross threads, called the *woof*, *weft*, or *shoot*, are inserted between them, by means of a little instrument sharp at both ends, called a shuttle, which is briskly shot from one of the weaver's hands to the other, placed on the opposite side of the work, and carries the thread with it. This is the simplest kind of weaving: but numberless are the additional contrivances made for all the curious works wrought in the loom, which have been the objects of human ingenuity for many ages.

Linen fabrics are of all degrees of fineness, from coarse sheeting to cambric almost emulating a spider's web. They are brought to that extreme whiteness which we so much admire by the process of bleaching. This consists in their exposure to the action of the sun and air, with frequent watering, and often with the help of some chemical liquor, which quickens the operation, but is apt to injure


the cloth if not applied with great caution. The value that can be given to a raw material by manufacturing is in few instances more strikingly exemplified than in the conversion of flax into Point or Brussels lace, some of which sells for many pounds a yard. Indeed, if you look at a plant of flax growing, and then at a fine cambric handkerchief, you cannot fail to be struck with admiration of human skill and industry.

Linen is one of the comforts of civilised life. It is cooler and more cleanly than any other wearing material, as it is free from downiness, and presents a smooth surface. We therefore prefer linen, or did so before the cheaper fabrics of cotton gained a frequent preference, for our under garment; but it would be too cold for our climate did we not cover it with others of a warmer texture. Even when worn to rags, linen has still a considerable value; for the finest writing and printing paper is made from it. But paper-making is an art which does not come within the scope of my present design.

Hemp is a much taller and stronger plant than flax. It has a square rough stalk, rising

to the height of five or six feet, and sending off branches. It is an annual plant, produced from seed. The young ones come up, some male, some female; the former, furnished only with flowers producing a farina or dust; the latter, yielding the seed. Hemp thrives best in a rich moist soil, especially on the banks of rivers; and it prefers the temperate climates to the hot, and appears to be a native of most of the north of Europe, where it has been cultivated for ages. When come to maturity, it is plucked up and laid to rot, like flax. Its fibrous part consists in the bark surrounding the main stalk, within which is a hard woody part, of no use. It is therefore necessary either to strip off the bark, or, by hard beating, to convert the inner portion to a dust, which may fly away. Hemp undergoes the same general preparation as flax before it is consigned to the weaver; but being of a stronger and coarser texture, it requires more labour to get the fine fibres separate from the rest. Hence it is commonly employed in the more homely manufactures, and hempen cloth is seldom made finer than to serve for sheeting and shirts for the lower classes, for which

purposes it was formerly grown and manufactured in Suffolk, and largely imported from Russia. It is the principal material of sail-cloth, a fabric the strength of which is required to be proportional to the violence it has to undergo from storms and tempests. Hemp is rendered still more important to navigation from its use in making cordage. For this purpose it is taken nearly in a raw state and twisted first into coarse twine, which is afterwards united to make rope; and several ropes twisted together go to form a cable of strength and thickness sufficient to hold the largest man of war at her anchors. Chain cables, however, have in part superseded it for this purpose. The consumption of hemp in a maritime nation like this is prodigious, on which account vast stores of it are constantly laid up in our naval arsenals. But we are now got beyond our proposed subject of materials for clothing, and it is time to conclude.



LETTER XII.

VEGETABLE CLOTHING CONTINUED.

You now have seen, my dear boy, that the inhabitant of the northern and temperate regions, has been obliged to exercise much labour and contrivance in procuring his vegetable clothing from the stalks of plants. In the meantime the native of the fruitful south has been enjoying the benefit of a material presented in greater abundance; and in a state requiring much less preparation before it is fitted for the manufacturer. This is cotton, a plant the history of which ought to be familiarly known to every one, in a country where it supplies the raw material of the greatest and most lucrative manufacture ever carried on in the world; one the products of which have superseded wool in the proud distinction of being held the *staple* commodity of England.

The name *cotton* has been adopted into modern European languages from an Arabic word for the same thing, which, put into English letters, would be pronounced *kutûm*. *Gossypium*, the name given by botanists to the genus of plants which yields the different kinds of true cotton, is almost exactly the *gossipion* of Pliny's "Natural History." Cotton belongs to the natural order of malvaceous, or mallow-like plants, of which you no doubt are acquainted with several garden species, such as the hollyhock, the lavatera, the alcea; and two or three wild mallows besides. The cotton plant is distinguished by large handsome flowers of a yellow orange, or reddish colour, with five petals. The seed-vessel is divided into either three or five cells, each containing several seeds, which are completely covered with long down, closely adhering to them. While the seeds are unripe, they remain covered with a capsule, or husk; but this, after a time, splits from the top downwards, and the seeds push through the opening, wrapped in their down, forming light elegant balls of the purest white, or of pale yellow, or reddish

brown of various shades, which, if not gathered, are quickly blown away and dispersed. The leaves are large and deeply cut, a good deal resembling those of the vine. There are several varieties, some herbaceous, some shrubby, and some reaching the stature of a small tree.

The cotton plant is very impatient of cold, and whether in a wild or cultivated state, is only found between the tropics and in the warmest parts of the temperate zones. In Asia its northern limit is formed by the Himalaya Mountains, the Caucasus, and the Black Sea. It is confined in Europe to the more southern of the Mediterranean islands, and a few sheltered spots on the shores of Spain, Italy, and Greece. On the continent of America it is scarcely found north of Carolina, or south of Chili and Brazil. In the Indian Ocean it grows on the islands to the north of Australia, and its culture is extending to that new continent itself. It is likewise found in Otaheite, and in several of the groups of islands of the South Sea. Thus it belongs to the happy climates of every quarter of the globe. In the Old World it

appears to be an original native of the countries east of the Indus; but at what distance of time it was first cultivated and manufactured there, is wholly unknown. The first distinct mention of it we possess, is from Herodotus, the earliest Greek historian, born somewhat less than 500 years before Christ, in his description of India. "There are there," says he, "wild trees that bear wool on their fruit, which in beauty and goodness excels that from sheep; and from these trees the Indians obtain the materials of their clothing." At an early period the manufacture was introduced into the neighbouring country of Persia, where the plant grows wild.

The expedition of Alexander the Great, in which he crossed the Indus, and on his return sailed down it to the Persian Gulf, added considerably to the knowledge possessed by the Greeks of the native products of India. It did so the more, because this mighty conqueror, having enjoyed the benefit of being the pupil of a still greater man, the illustrious Aristotle, the father of scientific natural history, took effectual means to have specimens collected for him, of all the

new plants and animals which were met with. Several notices of cotton in Greek writers are derived from officers who accompanied Alexander in his grand expedition. Nearchus, his admiral, wrote to this effect: "That there are in India, trees bearing, as it were, flocks or bunches of wool; that the natives, having made it into cloth resembling linen, form their dress of it, which consists of a shirt reaching to the middle of the leg, a piece loosely folded about the shoulders, and a turban rolled round the head; and that this linen is finer and whiter than any other." A pretty exact description of the clothing of the Hindoo even at the present day.

By the conquests of Lucullus, Sylla, and Pompey, which, during the last century before Christ, added Lesser Asia, Syria, and the neighbouring countries to the dominions of Rome, the use of cotton cloth or muslin, was first introduced, amongst other new articles of convenience or luxury, into the ruling city. A trade in Indian cotton, had been carried on by the Red Sea through Egypt for ages before it was ever cultivated in

that country. As early, at least, as the beginning of the fourteenth century, the Genoese and Venetians carried cotton-wool to Flanders and England; but, except for making candle-wicks, we know not to what purposes it was applied.

In the year 1534, Bristol ships trading to the Levant, brought, among other commodities, cotton-wool, and soon afterwards some coarse goods were manufactured in Lancashire and Wales, in which it seems to have been worked up with a warp of flax.

Cotton is certainly indigenous in America. The natives encountered the Spaniards on their first arrival in breastplates quilted with it; their priests were clad in robes of the same material, and cotton, both raw and manufactured, has been found in the tombs of the ancient Peruvians. That it should have been a full century and a half after the discovery of the New World, before the nations of Europe began to import this article from their settlements in Brazil, Guiana and the West Indies, appears strange; but from the fineness and shortness of the fibres it was in fact, far less suited for hand-spin-

ning than their native products, wool and flax, or even silk. On this account, the manufacture languished till the mechanical powers were called in aid.

It was in 1767, that the *spinning-jenny* was contrived, which draws several threads at once, and has other advantages over former methods. Within the space of ten years, the carding machine, and several other inventions of the highest value and importance were introduced, and fresh improvements were added daily, such was the activity and force of mechanical genius now turned in this direction. A *water-wheel* was employed for a while; but before long the gigantic power of steam became the prime mover in all the operations.

Cultivated cotton is usually of the herbageous kind, and raised from seed. The plantations, it is said, much resemble vineyards. Its culture is easy, and any soil suits it, when once it has taken good root. In the West Indies two crops are gathered in a year. The cotton is picked out of the pods by the fingers, with the seeds sticking to it. These are separated by mills, which pull out

and loosen the down. It is then in a fit state to be sent from the planter to the manufacturer. All the subsequent operations are performed by the system of complicated machinery to which I have alluded. Dr. Darwin in his "Botanic Garden" has given a highly poetical description of one of the cotton-spinning machines, established on the bank of the Derwent in Derbyshire by the inventor, the late Sir Richard Arkwright. I shall treat you with some of the lines, in which you may admire the life and animation given by the art of the poet to a mere piece of mechanism. But you must previously hear the explanation in plain prose.

"The cotton-wool is first picked by women from the pods and seeds (those no doubt, which are left after the rough separation in the country where it grows). It is then carded by *cylindrical cards*, which move against each other with different velocities. It is taken from these by an *iron-hand* or comb, which has a motion similar to that of scratching, and takes the wool off the cards longitudinally in respect to the fibres or staple, producing a continued line loosely cohering,


called the *rove* or *roving*. This rove, yet very loosely twisted, is then received or drawn into a *whirling canister*, and is rolled by what is called the centrifugal force in spiral lines within it, being yet too tender for the spindle. It is then passed between *two pairs of rollers*: the second pair, moving faster than the first, elongate the thread with greater equality than can be done by the hand. After this it is twisted on spoles or bobbins." Now for the lines:

"First with nice eye emerging Naiads cull
From leathery pods the vegetable wool;
With wiry teeth *revolving cards* release
The tangled knots, and smooth the ravell'd fleece;
Next moves the *iron-hand* with fingers fine,
Combs the wide card, and forms the eternal line;
Slow, with soft lips, the *whirling can* acquires
The tender skeins, and wraps in rising spires;
With quicken'd pace *successive rollers* move,
And these retain, and those extend, the rove;
Then fly the spoles, the rapid axles glow;
And slowly circumples the lab'ring wheel below."

Our now enormous demand for the raw material of this vast manufacture is supplied from three different quarters of the globe. Georgia, the Carolinas, and the isles adjacent to their coasts, afford us by far the greatest

quantity, and of the very best quality. Brazil and the West India islands complete the supply from America. Surat and Bengal send tribute from Asia ; and recently Egypt has yielded an African contribution. The entire supply now amounts to above three hundred millions of pounds weight annually, and the demand appears to be still on the increase. Of the yarn, or cotton twist, spun in our factories, the greater part is woven in the populous towns of South Lancashire, or in Glasgow and its vicinity. The rest is exported in the form of twist for the use of the weavers of France, Switzerland, and Germany, who are active competitors with our own.

A greater number and variety of fabrics are produced from cotton, probably, than from any other material. They comprehend stuffs of every degree of fineness and thickness, from the transparent muslin or net of a robe embroidered in gold or silver, to the stout plush and the heavy counterpane ; and they afford, in printed calicoes, garments at once cheap and showy, adapted to the tastes both of the general population of European cities



and the untutored tribes of Guinea and Australia. The native fabrics of the East are also still imported into Europe. Some of these, by the advantage of an excellent material, and incomparable manual dexterity and patience in the workmen, though made with very simple machinery, surpass in richness and beauty any thing of European manufacture. The natives are said to perform their finest work in moist cool places under ground, which makes the cotton hold together so as to draw out to the thinnest threads; and the soft and delicate fingers of the Indian women give them the sense of feeling to a degree of nicety much beyond that of our common people.

It cannot be doubted that cotton, at present, clothes more people in the world than any other substance. Its peculiar advantage, besides cheapness, is the union of warmth with lightness, whence it is fitted for a great variety of climates. To the hot, it is better adapted than linen, on account of its absorbing quality, which keeps the skin dry and comfortable. The woolliness of cotton gives a

kind of nap to the cloths made of it, which renders them soft to the touch, but apt to attract dust. In the fine muslins this is burned off, by passing them between heated cylinders with such velocity as not to take fire, which you may conceive, considering the combustibility of cotton, to be a very nice operation. A readiness to catch fire is, indeed, a dangerous quality of this material, and many fatal accidents arose while fashion rendered muslins the prevailing material of even the winter dress of women. Much mischief also proceeded from colds taken in these delicate garments, which are by no means fitted to protect the wearers from the inclemencies of our variable climate.

The downy matter surrounding the seeds in some other plants has been employed for the same purpose as cotton, and by proper preparation has, in some instances, succeeded very well; but, in most cases, it is too brittle, or of too short a staple, to be used with advantage in the form of thread. It has however, afforded an useful material for stuffing beds and pillows, and for quilting. In this

way the down of a plant growing copiously upon some of our bogs, called cotton-grass, has been employed by the neighbouring poor.

Nothing further occurs to me on vegetable materials for clothing, and I shall next write to you on those of animal origin.

LETTER XIII.

ON CLOTHING DERIVED FROM ANIMALS.

I HAVE already suggested that one of the earliest notions of clothing was probably that of a simple transfer of the covering of an animal to a human body. For this purpose, some creature well furnished with wool or hair would be fixed upon, and the hide would first be worn in its natural state, that is, with the hair growing to the skin. In this state many are still used by the inhabitants of cold countries, both savage and civilised; and the elegant coverings of some of the smaller quadrupeds preserved in this condition, under the name of *furs*, make the most costly articles of dress; and serve for distinctions of civil dignities. The fur of a black fox, is a princely ornament in the North; and in our own country, the

robes of royalty, nobility, and justice, are decorated with the spotless ermine.

In the hide of an animal, the hair and skin, however, are two entirely distinct things, and are to be considered separately as materials for clothing. The skin is the proper integument of the body, serving to hold its parts together, and protect them from external injury. It is a moderately thick, tough membrane, elastic, extensible, and impenetrable to fluids. The hairs spring from minute bulbs, roots as they are called, just beneath the skin, pass through, and are strongly attached to it. The bodies of most quadrupeds are nearly covered all over with hairs, but they differ much in fineness and closeness. It is chiefly the smaller species which are provided with those soft, thick, glossy coverings that bear the name of fur, and they are found in the greatest perfection where they are most wanted, that is, in the coldest countries. They form the riches of those dreary wastes which produce nothing else for human purposes; and their value has tempted men to expose themselves to the utmost hard-

ships of cold and hunger while pursuing the chace amid perpetual frost and snow.

The nations of classical antiquity knew nothing of furs as articles of luxury or display. Notwithstanding the example of Hercules, I am acquainted with no later Grecian hero who is depicted with the hide of the wild beast, which he has slain, thrown over his shoulders. We learn from Homer, that in the so-called *palaces* of their kings, sheepskins, or the separated fleeces, made the bedding, and chair and couch cushions of the family of the chiefs, and their principal guests; ox-hides served their attendants to sleep upon. A cloak of shaggy goat-skin protected him who went forth to brave the night and the storm. But all their pride of dress was placed in the cloaks, or mantles, of fine wool spun and woven under the direction of the ladies, sitting in the midst of their damsels; and at once urging and sharing their labours. These garments are described as diversified with intricate patterns; and glowing with flowers of the richest tints. The most splendid of all are said to be "the accomplished work of fair

Sidonians," whose skill was celebrated far and wide. The ladies decorated their husbands with these mantles when they went to battle; and they kept a number of them stored up in chests among their choicest treasures. In Homer, the Queen of Troy, spreads her widest and best, which "shone like a star," on the knees of the statue of Minerva, as a supplicatory offering.

The national pride of a noble Roman long rejected all foreign luxuries in dress. Even the Emperor Augustus, contented himself as we have seen, with a simple toga of white wool; and boasted that it was the domestic manufacture of his wife and daughter. Furs were viewed by the Romans with lofty scorn, as a fit garb for savages ignorant of all the arts of life, unable to spin or weave.

To this contempt succeeded horror and aversion, as the Romans had more cause to become acquainted with the rude but formidable hordes of fur-clad Scythians and Sarmatians, who hovered on the northern borders of the empire; and from time to time, rushing from their frozen deserts,

spread terror and desolation far and wide by their incursions.

It was by these very barbarians, when they had made themselves masters of the fairest provinces of the Roman empire, that furs were at length introduced into the west of Europe, as objects capable of adding splendour to the display of nobles, and dignity even to the state of kings. They now took rank with cloth of gold and the most precious jewels, and the four *noble furs*, as they were called, ermine, sable, vair, and gris, became distinctions in heraldry. The prices given for them were enormous, and they were coveted with a kind of frenzy.

During the period of the crusades this passion was at its height, from which it afterwards very gradually declined. The northern regions of Scandinavia and Siberia alone supplied these precious spoils, till the progress of American discovery opened a new and almost boundless field to the fur-hunter. The French began this traffic from their colony of Canada, before we conquered it. At present the Russians and the United States divide this commerce with us. Their

respective Fur Companies hold fortified stations on the farthest points of those snowy deserts where life can be made endurable. To these the wild Indians repair to barter the produce of their hunting, for blankets, beads, guns, and ammunition; and, unfortunately, for large supplies of ardent spirits. Travellers are likewise sent out from the stations, to collect skins among the more distant tribes, men of iron frames and dauntless courage, of whose almost incredible endurance of all extremes of cold and hunger, daring exploits, and hairbreadth escapes, you have probably read some striking stories. Such are the strange charms of this wild life of peril and adventure, that those inured to it can scarcely be ever induced to exchange it for a state of security and repose.

The animals of America, whose skins are an object of commerce, are of many different kinds. No quadruped, in fact, could exist in those realms of perpetual winter unless supplied with a coat of such depth and thickness as to be available for one or other of the various purposes of men. Some of the most valuable are of the weasel kind; to

these may be added the beaver, several species of foxes, wolves, bears, deer, and numerous others.

There, beneath the shining waste,
The furry nations harbour: tipt with jet
Fair ermines, spotless as the snows they press ;
Sables of glossy black ; and dark embrown'd,
Or beauteous freak'd with many a mingled hue,
Thousands besides, the costly pride of courts.

Thomson.

Fur is used either growing to the skin, or separated from it. In the first case it is necessary to preserve the skin from decaying or putrefying. This, in the smaller furs, is easily effected by first cleansing them well, and then hanging them to dry in the wind. The larger are besides dressed with some astringent powder on the inside. In this state they are most commonly used for the lining or facing of garments, and are sewn on to the other material in slips or patches.

In its detached condition, fur is usually employed in making a stuff called *felt*. This manufacture is one of primitive simplicity, and even more ancient probably than weaving. It is merely a matting or clotting together of *animal* filaments, and the operation depends

upon a peculiarity in the structure of all hairs, which, however smooth and uniform they may appear to the eye, have in reality a scaly texture on the surface. The scales are so disposed that the finger moves smoothly when drawn along the hair from the root to the point, but encounters a sense of roughness and resistance on passing in the contrary direction. From this property, hairs when beaten or pressed together, are disposed to catch hold of, and twist round each other, and thus to cohere into a mass. All hairs are thus in some degree capable of felting, but none so much so as wool, the filaments of which are naturally so curled and crinkled, that each hair takes firm and ready hold of its neighbour. Goats' hair, and the downy part of that of the camel, and the wool of the beaver, have likewise been found well-fitted for the purpose; but wool has always been the staple material of this manufacture.

Among the pastoral nations of the north-western countries of Asia, from the earliest ages to the present day, this fabric has been in daily use for the most essential purposes, and they were probably its inventors. The

Tartar, or Turcoman, dwells under felt, in his movable lodge or tilted waggon; and a wide mantle of felt serves him for bedding, which in bad weather he wears over his other clothing, with a cap of the same substance.

Felt is mentioned by Homer, and Greek and Roman writers are full of notices of its various uses. It was the general material of men's hats and caps; in war a lining of felt was worn under the helmet, and shirts of it were adopted by the Greeks, as they were by the soldiers of Cæsar in his war with Pompey, as a defence against arrows. Military engines and wooden towers were sheathed in it at the sieges of cities, and the Greeks made jackets of it to protect the fine and valuable coats of their soft-woolled sheep.

Among ourselves, till of late, when many new uses have been found for it, felt was little employed except in hat-making. The older covering, indeed, even of men's heads was with us a cap of wool, silk, or velvet according to the rank of the wearer. Henry VIII. and his son young Edward are always represented in caps, but hats had become *fashionable* long before their time in France

whence we probably received them. Every one knows the portrait of the great Lord Bacon in his high picked crowned hat. The material first employed was the genuine fur of the beaver; an animal then found in considerable numbers on many rivers of the European continent, and on several of our native streams. Afterwards, a fresh supply of the skins was derived from the fur grounds of America; but the defencelessness and the value of the animal caused so vast a havock to be made of the species that it has now become scarce even in the "far West," and common beaver hats lost all title to the name. A small portion only of this expensive fur was spread like a kind of plating over those of the best quality; the other materials were the fur of the musk-rat of America, which comes nearest to the beaver in value, and that of the rabbit and the hare. Of late however a kind of silk plush has superseded fur of any kind for this purpose; this material is not capable of felting, and has therefore no concern with our present subject. A cheaper kind of hat is still made of common woollen felt.

The longer hairs of animals are employed in making woven stuffs of various kinds; but I shall reserve what I have to say of these till I have given you some account of the important article of wool, and its use in the manufacture of clothing.

Meantime, farewell.

LETTER XIV.

ANIMAL CLOTHING CONTINUED.

WOOL.

OF all the materials for clothing afforded by animals, the wool of the sheep has been preferred by the greatest number of people in all ages, whether still adhering to the skin, clotted into felt, or spun and woven into cloth. This useful and innocent creature, originally, it is probable, a native of the north-western portion of Asia, has been domesticated in all the climates of the globe between the extremes of heat and cold; and in all it has not only bestowed upon man its flesh, and often its milk, for his nourishment, but its fleece for his clothing. The skin with the wool growing to it, has been the dress only of savages, or of tribes little advanced beyond them. A sheep-skin cloak is however still the usual garb of the peasants who carry

their commodities for sale to the markets of Petersburg and Moscow.

Wherever civilisation has prevailed, the wool plucked off, or sheared from the skin, has been employed as a material for the fabrication of cloths of different kinds. This wool, you know, may be taken from the living animal at the approach of summer without hurting it, and is annually renewed. Sheep-shearing is one of the most interesting of the rural festivals, and has afforded a subject of pleasing description to several poets. Indeed *pastoral poetry*, celebrating the innocent and simple life of shepherds, while, surrounded by their fleecy charge, they lie stretched under the shade of a tree, playing on the pipe or singing the charms of their shepherdesses, was long the especial delight of courts and cities, where the contrast gave it a heightened zest. But this is a digression from the sober business of my letters.

England was far from being the earliest of the European nations in setting itself to manufacture of any kind; and wool, by far the most valuable and abundant product of *the island*, was long exported in a raw state

only, to feed the looms of France or Flanders. A part indeed was spun at home by the women, and woven into a coarse kind of cloth for domestic use; but all the finer fabrics, whether of silk, flax, or wool, required to add grace and dignity to the public appearances of the nobles of the land, were to be brought at great expense from the continent. Edward III. endeavoured to correct this practice in part by giving encouragement to foreign weavers to settle in England, and prohibiting the wearing of any woollen cloth not of home manufacture. By degrees English cloth found a foreign demand, but only in its native colour; it was not till the reign of James II. that the art of dyeing was introduced from Flanders, and our staple manufacture begun to enter into competition with the fabrics of our industrious neighbours, in the brilliancy and variety of its colours no less than in the evenness and firmness of its fabric.

Wool differs from common hair in being more soft and supple, and more disposed to curl. These properties it owes to a degree of unctuosities or greasiness, which is with difficulty separated from it. Its qualities in respect to fineness, length of staple, and

colour, differ greatly in different breeds of sheep, and even in different parts of the same fleece. Peculiar attention has been paid to the selecting of such breeds as yield the best wool for different purposes, and treating the animal so as to improve it to the highest possible degree. The Spanish wool was long allowed to be the finest that Europe afforded, but it is that of Saxony which now bears the highest price in our market. The famous Merino flocks, anciently the property of the kings of Spain, the periodical migrations of which from province to province for the benefit of pasture were a royal privilege and state concern, are no more. They were destroyed in the French invasion, and have never been renewed. But a flock of this noble breed presented by the Spanish sovereign to George III., was transferred about thirty years ago to our colony of New South Wales, in which genial soil and climate, its progeny speedily increased and multiplied beyond all former example. The Australian wool is next in fineness to the Saxon, and now affords a large supply to our *manufacturers*. Some of our native kinds pro-

bably excel all others in length of flake. There is indeed, no kind of wool of which very good samples are not to be found in this island, for nowhere have more pains been taken to vary and improve the breeds of sheep. The whole wool, as taken from the animal's body, is called a *fleece*. The first operation this undergoes is that of picking and sorting into the different kinds of wool of which it is composed. These are next to be cleansed from marks and stains, and freed from their offensive greasiness. When the wool is cleansed, it is delivered to the wool-comber, who, by means of iron spiked combs of different fineness, draws out the fibres, smooths and straightens them, separates the refuse, and brings it into a state fit for the spinner. In his operations he is obliged to use a good deal of oil, which is afterwards to be washed out. The spinner's work, now performed by machinery, forms the wool into threads, which are more or less twisted, according to the manufacture for which they are designed. The more twisted is called *worsted*; the looser, *yarn*.

The kinds of stuffs made wholly of wool,

or with a mixture of flax, silk, or cotton, are extremely various; and Great Britain produces far more of them, in quantity, and in general of better quality, than any other country in Europe. Our broad-cloths form the principal article of the dress of men of the superior classes; and a more perfect manufacture, with respect to beauty and utility, cannot easily be conceived. The threads in it are so concealed by a fine nap or down raised on the surface, and curiously smoothed and glossed, that it looks more like a rich texture of nature's forming, than the work of the weaver. It is to be observed that wool, in common with other animal substances, takes a dye better than any vegetable matters. Our cloths are therefore made of every hue that can be desired; but in order to fit them for the dyer, they must be first freed from all greasiness, and foulness. This is done by the operation of *fulling*, in which the cloths are beaten with heavy mallets as they lie in water with which a quantity of clayey earth has been mixed. The best for this purpose is called *fulling earth* of which there are pits in several p

of England. It unites with the greasy matter, and renders it soluble in water; so that by continually supplying fresh streams, while the beating is going on, all the foulness is at length carried off. You have probably seen fuller's-earth employed in a small way in getting grease spots out of your clothes. The operation of fulling has the further effect of thickening the cloth, and rendering it more firm and compact, by mixing the threads with each other, something in the manner of a felt.

The cloths of inferior fineness are made of all qualities as to strength and thickness. Some of those used for great-coats, by their substance and shagginess, resemble the original fleece, or rather the fur of a bear; and render unnecessary the use of furred garments among us. Indeed, with the single material of wool, art has been able much better to suit the different wants of man in his clothing, than can be done by all the productions of nature. What could be so comfortable for our beds as blankets? What so warm, and at the same time so light, for pained and palsied limbs, as flannel? The

several kinds of the worsted manufacture are excellent for that elasticity which makes them fit close to a part without impeding its motions. This quality is particularly observable in stockings, of which article of dress, most of those worn by the inferior classes, and, in winter, by the superior, are made of worsted. The making of these by the simple machinery of knitting is, you know, a common domestic manufacture. In the large way they are wrought by a curious engine called a frame. Even the thinnest of the woollen fabrics possess a considerable degree of warmth, as appears in those very delicate cloths called shawls. The real shawls made of the fine wool of the Thibet goat are sold at higher prices than the richest satins, or velvets; but they have been well imitated by the product of some of our English looms. A very different article made of wool, yet equally appropriated to luxury, is carpeting. This is rather clothing for our floors than ourselves, but our feet receive the benefit of its warmth. In the East, soft carpeting is placed all round the room, upon which the natives recline or sit cross-legged, instead of

using chairs; and the beauty and richness of their carpets is a principal article of their domestic luxury.

It has already been remarked that the use of linen or cotton garments next to the skin, instead of woollen, is an improvement, since wool has always somewhat of a fretting, irritating quality, which some skins cannot bear. Hence it should never touch naked wounds or sores. In cold and damp countries, indeed, flannel keeps up an equable warmth and dryness which is very salutary, and on that account it has been much recommended for delicate constitutions. Upon the whole, Dyer's praise of wool seems to have a just foundation. Speaking of materials for clothing, he says,

"Still shall o'er all prevail the shepherd's stores,
For num'rous uses known: none yield such warmth,
Such beauteous hues receive, so long endure:
So pliant to the loom, so various, none."

Since the application of steam-power to weaving, the woollen manufacture has afforded as wide a field for the application of complicated machinery as its rival, or sometimes ally, the cotton manufacture. Like

this, all its operations are carried on in vast factories; female spinners and hand-loom weavers, working by their own firesides, are passing away even from living memory; but to make you comprehend the wonderful application of scientific genius, as well as practical skill in mechanical operations, by which the cloth of your jacket was brought to such a degree of excellence at so cheap a rate, would require not a letter, but a volume, with a portfolio of plates, or, best of all, a visit to a factory under a good guide. I therefore here conclude the subject and my present epistle.

LETTER XV.

ANIMAL CLOTHING CONTINUED.

SILK.

I HAVE already hinted that the hair of other animals besides the sheep has afforded a material for woven stuffs employed in clothing. Those quadrupeds in South America called by the names of llama, vicuna, and paco, and which modern naturalists rank with the camel, though much smaller, are covered with a wool resembling that of the sheep, and applied to the same purpose. Of these, that of the vicuna seems to be the finest of all, and is wrought into cloths of most exquisite silky softness and beauty. This is now imported in considerable quantity, under the name of *vigonia* wool. It is of a reddish colour, and is chiefly dyed of dark hues for ladies' winter

dresses, uniting in a high degree the qualities of lightness and fineness of texture with warmth.

The Angora goat is covered with hair of remarkable beauty. It is milk-white, glossy, and formed into long spiral ringlets. Such a promising material could not long be overlooked ; accordingly it is sometimes dressed as a fur and made into muffs, and we find that it has also given rise to the manufacture of the finest camlets and other stuffs for which that district in Lesser Asia is noted. The hair of the camel and the goat is also woven into stuffs for various purposes. Hair-cloths, indeed, are made from long hair of any kind ; but, in general, they are too harsh and rough for clothing, and are employed in other services. Bags of all sorts are still made in the East of goat's hair. This was the *sackcloth* worn by the Jews in their mournings, when they threw ashes on their heads ; and of the same material are those hair shirts, called by the French *cilices*, with which some superstitious persons have thought it meritorious to torment themselves by wearing next their skins.

Men must have been far advanced in civilisation and the observation of nature, before they found out a material for clothing in the labours of a caterpillar. China, one of the oldest peopled countries of the globe, and in which the arts of life have longest arrived at a high degree of perfection, appears to have been the first, and probably long the only one, to make use of the web of the silkworm. Neither the insect nor its product was early known to any of the commercial nations of the West. Aristotle is the first Greek writer in whom any mention of the insect is found, and the inaccuracies of his description prove that he knew it only by vague report. The Romans became acquainted with fabrics of silk chiefly, it should seem, by means of their long wars with the Parthians, whose very banners flaunted in silk before the eyes of their invaders. The poets of the court of Augustus often allude to the delicate down, "combed by the Seres from the leaves of trees." A passion for this new luxury in dress soon seized the Roman ladies; fine gauze was made for their use, which was called by the poets "woven

wind," and silk was long sold for its weight in gold. Notwithstanding the high price of the article, no attempt was made to introduce its culture into the Roman empire till A. D. 552, when two Persian monks arrived at Constantinople and presented the Emperor Justinian with a packet of silk-worms' eggs. The precious gift was dealt out along the shores and islands of Greece, where it prospered as soon to become the foundation of a splendid and lucrative manufacture, which the Greeks contrived for ages to keep secret to themselves, but which spread at length to Sicily, to Italy, to Spain, and to the south of France.

The insect, which in its perfect state is a kind of moth, is hatched in the form of a caterpillar, and passes from that state successively to those of a nymph or chrysalis, and at last of a winged insect. While a caterpillar, it eats voraciously of its proper and favourite food, the leaves of the white or paper mulberry. By this diet it is not only nourished but is enabled to lay up, in receptacles within its body formed for the purpose, a kind of transparent glue, which has the property

hardening as soon as it comes into the air. When arrived at full maturity, it spins itself a kind of cage out of this gluey matter, within which it is to lie safe and concealed during its transformation into the helpless and motionless state of a chrysalis.

I shall here step out of my way to remark, that there is not in nature a more striking example of what is called *instinct* in animals, than this fact of the webs spun by most of the caterpillar tribe. By instinct is meant an impulse to actions, of which the end or purpose is not foreseen by the performer, and which are not the consequence of instruction or imitation. Now, the caterpillar has never been taught by a parent, since it is not hatched from the egg till many months after all of its species are dead. Nor can it possibly, without the gift of foreknowledge, discern any use in spinning itself a temporary tomb, which it is to occupy under a new state of being. It works, therefore, in consequence of a blind impulse directing its plan and motions, for which we have no other name than that of an *instinct*: and I do not see how philosophers can refuse to admit the

reality of such a principle, how much they may be puzzled to account for.

To return to our subject. The worm's web is an oval ball, called of a hue varying from light straw to full yellow, and consisting of a sinew wound round and round, so as to form a close and impenetrable covering. It is so very fine, that when unraveled it has been measured to 700 or 1000 feet within the compass of a crow's egg. In a state of nature, the worm makes its cocoon upon the mulberry itself, where it shines like a globe among the leaves; and in the south of China, and some other of the warmer countries of the East, it is still sufficient, so, the cocoons being gathered from the trees without further trouble. But even in the rest of China, and in the most southern parts of Europe, the inclement weather in spring, when the worms are hatched, forbid the rearing of them in the open air. They are kept in warm rooms, constructed for the purpose, and regularly fed with mulberry leaves.

period of their full growth. It is a matter of nicety to keep back the hatching of the eggs till the season is far enough advanced to afford mulberry leaves. As this tree is one of the latest in leafing, silkworms cannot advantageously be reared in cold climates. During their growth they several times shed their skins; and many die under this operation. At length they become so full of the silky matter, that it gives them a yellowish tinge, and they cease to eat. Twigs are then presented to them upon little stages of wickerwork, on which they immediately begin to form their webs. When the cocoons are finished, a small number, reserved for breeding, are suffered to make their own way out of the webs in their winged state. This the insect effects, by emitting from its mouth a drop of liquid which has the property of dissolving that end of the cocoon by which it is fastened to its branch or twig; and thus of making a hole large enough for its passage. Such of the rest, as there is not time to wind off before they have thus extricated themselves, by which operation the silk would be greatly injured, are destroyed in the chry-

silk state, by exposing them to the steam of hot water.

The next business is to wind off the silk. After separating a downy matter from the outside of the cocoons, called *floss*, they are thrown into warm water; and the ends of the threads being found, several are joined together, and wound in a single one upon a reel. This is the silk in its natural state, called *raw silk*. It next undergoes some operations to cleanse and render it more supple; after which it is made into what is called *organizing*, or *thrown silk*, being twisted in different degrees, to serve, the looser for the warp, the firmer for the shoot in the different fabrics. This is done in the large way by mills of curious construction, which turn at once a vast number of spindles, and perform at the same time the processes of unwinding, twisting, reeling, &c. The largest and most complicated machine for this purpose in England, was set up at Derby, the model of it having been clandestinely brought from Italy, in which country all the branches of the silk manufacture have long flourished.

The excellence of silk as a material con-

sists in its strength, lightness, lustre, and readiness in taking dyes. It is likewise very little apt to be preyed upon by insects. When little known in Europe, it was highly prized for its rarity; it is now esteemed for its real beauty and other valuable qualities. As it can never be produced in very great abundance, it must always be a somewhat dear article of clothing. Silkworms are reared from China quite through all the warm and temperate climates of Asia; and in the southern parts of Europe. Provence and Languedoc, are the most northern districts in which they can be kept with advantage. In England, though silkworms are bred without much difficulty by way of experiment, yet the dampness of the climate, and still more, the dearness of labour prevents the production of silk from being an object worth pursuing for profit. What is used in our manufactures comes chiefly from China, Persia, and Lesser Asia in a raw state, or from Italy in that of organzine. •Our importation from China now amounts to the prodigious sum of three millions annually. The fabrics of silk are very numerous, and almost all

devoted to the purposes of luxury in and decoration. In thickness they vary from the finest gauze to velvet, the pile of which renders it as close and warm as a fur. Some of the most beautiful of the silk manufactures are the glossy satin, the elegant damask, in which the flowers are of the same hue as the piece, and only show themselves from a difference of shade; the rich brocade, in which flowers of natural colours, or of gold and silver thread are interwoven; and the infinitely varied ribbons. It is also a common material for stockings, gloves, buttons, strings, &c., in which its durability abundantly compensates for its dearness. Much is also used for the purpose of sewing, no other thread approaching it in strength. Silk, in its natural state, bears the same superiority among cloth materials, that gold does among metals; it gives an appearance of richness wherever it is employed, and confers a real value. When the refuse of silk is carefully collected, it serves for useful purposes. The down from the cocoons and the waste separated in the operations of raw silk undergoes, are spun into a coarser thread, of which very service

stockings have been made. The interior part of the cocoon, which is a kind of thin but tough membranous film, is reckoned to be the best material for making artificial flowers.

As I have mentioned that the greatest part of the caterpillar tribe spin themselves similar webs, you will perhaps wonder that none of these have been employed like that of the silkworm. Some trials have, in fact, been made; but these other insect-webs have all either proved inferior in quality to the true silk, or cannot be procured in quantity sufficient to render them an object of attention. But you will be surprised to be told that the product of a shell fish residing at the bottom of the sea is actually employed for the same purposes. This is a species of large muscle, called *pinna marina*, found on the coasts of Naples, Sicily, Minorca, and other islands of those seas, which, by means of some wonderful contrivance of nature, has the faculty of spinning from its body certain fine brown threads, by which it fastens its shell firmly to the rocks. These threads collected form a remarkably fine kind of silk, of which

clothing, shoes, and other articles
manufactured by
a race of men.

For this is a proper place for a
man.

LETTER XVI.

THE MANUFACTURE OF LEATHER.

You remember that, on first mentioning the hide of animals as a material of clothing, I distinguished between the covering of the skin, and the skin itself. Having now gone through the principal uses made of the former, I proceed to give you some acquaintance with the methods employed to render the latter useful. The nature of this integument, or covering, of the body, I have already described to you ; and it is not to be wondered at that men should soon have sought an additional garment, in that substance by which they found their own bodies naturally protected. The tough hide of the wild beast, which it had cost the ancient hero so much pains to pierce, would readily suggest itself to him as an excellent defence.

from the blows of other warriors, or from injuries he might sustain in passing the tangled forests or amid rugged rocks. The resistance made by the skin to hurtful wounds is, indeed, in some animals surprising. Thus, the badger, whose skin adheres very loosely to the flesh, can scarcely be destroyed by the teeth of the dogs that worry it; but will retain life after undergoing for hours the severest baiting.

The difficulty would, however, immediately occur of preserving the skin stripped from the animal in a state fit for use. If no preparation were done to it, like all the other soft parts, it would soon grow putrid; and if this were prevented by drying, it would become hard and shrivelled. What art, therefore, has been attempted in its preparation, has been to impregnate it with a matter capable of preserving it from putrefaction; and at the same time to keep it in a state of flexibility and suppleness. When this is effected, skin comes to be called *leather*, so called from the adjective *lithe*, that is, flexible, — a substance of the highest utility, as well in clothing, as

numerous other purposes. The art of preparing leather consists of a variety of processes, some of them tedious and complicated. The simplest, the most imperfect, and one which is still widely practised by many tribes of almost savages, is merely mechanical. It consists in first moistening the skin with water, and then, by dint of hard rubbing, pulling, and stretching, forcing grease of any kind into the pores, in proportion as the water evaporates. The oil is thus introduced among the fibres of the skin, rendering it supple and as long as it remains there, keeping out water, and thus preventing it from swelling, hardening, or corrupting. Homer, who never scrupled to take his similes from common, or even vulgar objects, provided they supplied an apt illustration, likens the struggle of his Greek and Trojan heroes for the possession of the dead body of Patroclus, to curriers thus occupied about a hide. The passage has been literally translated thus: "As a man giving to his servants to be tanned a great bull-hide drunken with grease; they surround the hide, and tug and strain

it this way and that, in every direction ; as they pull, the grease goes in and the water comes out."

The native Indians in the country now west of Canada, practise a somewhat simple method of preparing their deer and buffalo hides. They mix the brains and some of the softest part of the fat of the animal, into a kind of lather ; and soak the skin in it some hours ; then take it out, rub it in their hands till nearly dry ; and afterwards hang it up in the smoke. In a few days it is taken down, well rinsed and wrung out with water, and rubbed frequently while it is drying. Thus prepared by the patient labour of their women, these skins, called buffalo robes, serve them for clothing, for bedding and for tent coverings.

The skins of all animals are capable of being made into leather ; but some are too small for use, — yet the ingenuity of our manufacturers has discovered in those of the reindeer an excellent material for ladies' shoes. In this country many kinds of skin are employed, and for a vast variety of purposes. The thickest and most substantial leather

such as boot-soles are made of, is prepared from the hides of the ox kind; and besides what our domestic cattle supply, we import great quantities from South America, the produce of the half-wild herds of European extraction, which pasture on the wild plains stretching from Buenos Ayres towards the Andes; and of late years the similar herds of Australia have afforded us their contribution. Formerly, when metallic armour was going out of fashion, but men still desired some better protection in battle than their ordinary clothing, a very thick but supple leather was made from the hide of the urus, wild bull, or buffalo, then plentiful in the forests of Poland, Hungary, and Prussia. It was called *buff* leather, from the common name of the animal; and would turn the edge of a sword or a pistol bullet. During our civil wars, in the time of Charles I., it was in great demand; but has been gradually disused.

Sheep-skin is much more employed for many other purposes than clothing, it is used however, for women's shoes, and in the form of wash-leather, for under waistcoats, and gloves; but for the last article, lambskins,

... are greatly pre-
... employed in the
... of leather,
... more than give you
... of the principal
... by the
... with water
... dirt. After
... upon a solid
... beam, where
... flesh. It
... a mixture
... is kept about
... is to swell
... the hair.
... the beam, the hair
... committed to
... The contents of this are
... of pigeon's is pre-
... and its operation is to
... which the lime had
... effected, it is again
... and is then put into
... called the *ooze*.

which is an infusion of coarsely-powdered oak-bark in water. The bark of the oak, as well as every other part of it, abounds in a strongly-astringent matter; and it is the thorough impregnation with this which preserves the hide from decay or putrefaction. Other vegetable astringents will equally serve the purpose, and are used in some countries; but with us, none is found so strong and so plentiful as that yielded by the oak. A weaker ooze is first employed, and the hide is frequently turned and worked in it. It is then removed to a stronger; and lastly into the most powerful, with fresh bark: and these different steepings take up a considerable time, greater or less according to the size of the hide and other circumstances. When at length it is thought to have imbibed enough of the astringent matter, the hide is taken out and hung upon a pole to drain, after which it is put upon a piece of wood with a convex surface called a *horse*, on which it is stretched, and kept smooth and even. Finally it is taken to the *drying-house*, a covered building with apertures for the free admission of air; and it is there

hung up till it becomes completely dry ; and thus the process of tanning is finished.

From the tanner, the hide or skin is consigned to the *currier*, whose art is further necessary in order to make it perfect leather. He first soaks it thoroughly in water, and then places it upon a *beam*, made of hard wood, with one side sloping and polished. He lays it with the grain side, or that on which the hair grew, inwards, and the flesh side outwards. He then, with a broad two-edged knife having a handle at each end, shaves or pares the hide on the latter side, till all its inequalities are removed, and it is reduced to the degree of thinness required for use. After this operation it is again put into water, then scoured, and rubbed with a polished stone. It is next besmeared with a kind of oil procured from sheep- or deer-skin, or made by boiling train oil and tallow together ; the intention of which is to soften or supple it. A great part of its moisture is then evaporated by hanging it up in a drying-house for some days ; and it is further dried by exposure to the sun, or to the heat of a stove. Afterwards it is differently treated

according as it is meant to be blacked or stained, or not. Without entering into minute particulars, it is enough to observe, that the astringent principle with which the leather has been impregnated in the tanning, renders nothing necessary except the application of a solution of sulphate of iron, at once to strike a deep black. This is laid on with a brush, generally on the grain side of the leather; and it afterwards undergoes the operation of giving it that roughness which is called the *grain*. This is performed by rubbing it in all directions with a fluted board. When leather is blacked on the flesh side, the colour is given by a mixture of lamp-black and oil.

It is in the manner above described that leather is prepared for the making of shoes and boots, which is one of the principal uses of this material; and certainly no other substance could so well unite strength and suppleness, with the property of keeping out water. Good shoes are one of the most necessary articles of dress for health and comfort to those who go much abroad; nor has human industry in many cases more happily

xerted itself than in discovering the most perfect mode of answering the purposes required in this manufacture. The great length of the process, however, has put many persons upon experiments to abridge it; but though this may perhaps be done to a certain degree, yet it is probable that time, in this instance, as in many others, will effect what no substitute can do; and that the long and numerous soakings are necessary thoroughly to impregnate the hide with the preservative matter, without injury to its texture. Leather is capable of being dyed of various colours besides black, by means of different drugs. These variations, however, I do not mean to enter into. For the more delicate work, in the shoe manufacture, the skins of the goat, dog, seal, kangaroo, and some other animals, are employed. Within the memory of persons still living, leather was a common material for the waistcoats and breeches of labouring men, being cheaper at that time than any woven fabrics; in so imperfect a state were our manufactures.

There is another mode of preparing leather *quite different* from the preceding, which

called *tawing*. It is chiefly practised upon kid-skins, for the manufacture of fine gloves. The skin is first washed, and then soaked in lime-water in order to get rid of the hair and grease. It is then softened in warm water and bran, and stretched out to dry; which renders it transparent. The preservative liquor is next applied, which is here not a vegetable astringent, but a solution of alum and common salt. With this it is impregnated so as to admit of keeping in that state several months. The next operation is to wash out the superfluous salts with warm water, which must be done with great nicety. Afterwards, it is moderately dried, and then thrown into a tub in which yolks of eggs have been well mixed by beating. The skins are trodden in this, till all the egg is incorporated in their substance, which is thereby rendered more solid, and at the same time soft and pliable. Blood is sometimes, for cheapness, used instead of eggs, but it communicates a colour which cannot be entirely discharged. The skins are then dried again, when they become fit either for taking a dye, or for being glossed if preserved white.

The method of preparing goat-skins for the celebrated morocco leather resembles this; but the thickening matter in which these skins are trod is a bath of white figs with water.

It would be easy to lengthen this letter by descriptions of other methods of preparing skins, as practised in different countries with greater or less simplicity; but I hope I have said enough to afford you clear ideas of the leading purposes in view, and the essential operations for effecting them. I will therefore keep you no longer upon this manufacture, which, though curious, is not one of the most pleasing. I now, likewise, conclude the whole topic of the arts concerned in clothing. Adieu.

LETTER XVII.

ON THE ARTS OF PROVIDING SHELTER.

“ And teach us further by what means to shun
 Th’ inclement seasons, rain, ice, hail and snow.”
Paradise Lost.

It is not of great importance to ascertain the exact order in which the different arts of life were introduced among mankind; else it might be contended that the want of shelter from the storm would be felt earlier than that of clothing, at least in a warm climate. A place of refuge during the darkness of the night, while beasts of prey were roaming about for food, would also immediately appear desirable. We have indeed at present an instance of this kind in several tribes on the banks of the Amazon, who construct very substantial and convenient wooden houses, and practise skilfully several of the arts of

life, while they entirely dispense clothing.

The example even of the brute animal would soon attract the notice of the human savage. Few of these, who have instinct for a guide, are unprovided with a lodging or habitation of some kind for nightly repose or as a retreat from the inclemencies of weather. Some make holes under ground, in which they have even the skill to scoop out chambers or apartments for different purposes. Some occupy the natural clefts and caverns of rocks. Some form their dens in the thickest growth of underwood in forests. The tribes of birds are particularly remarkable for the art they exercise in forming their nests, several of which display extraordinary marks of contrivance. Yet in some instances they sometimes exhibit a still greater degree of skill; and the covered galleries of the wasps and cells of the bee, may vie with the most studied productions of human ingenuity.

There is this difference, however, between the subjects of instinct and the products of reason; that while the first are prompt to *provide* for their wants, each tribe in

particular manner, and that always the best for its purposes, man is left to discover, through a long course of experiments, how best to avail himself of the variety of means and materials placed at his disposal in different climates and circumstances. Accordingly, the contrivances for shelter of the human creature are of every imaginable degree of simplicity and complexity, rudeness and refinement. Some of the savages of Australia content themselves with tying together the heads of their tall grasses, as they grow, and creep beneath the arch; others take a large sheet of the bark, which most of their trees have the habit of shedding every year, and bending it, and sticking the two ends into the ground, find themselves sufficiently housed for the night. In countries where better protection would be desired both from the inclemencies of the weather and the intrusion of wild beasts, the savage, who seldom chooses to give himself unnecessary trouble, would at first perhaps merely usurp from those beasts their natural shelter in the rocks. The want of tools would often be an impediment to his progress; but if he were

situated near a bank of a soft crumbling rock, he would soon find himself able, by the help of a sharp hard stone, to hollow it out into winding passages and chambers beyond the reach of the driving storm, and capable of being secured from attacks. Whole nations are recorded to have lived in habitations of this sort, called by the Greeks Troglodytes, or dwellers in caves; and even in the midst of civilised society, the convenience of such a mode of lodging has caused it to be continued. Thus, the French poet Boileau, in the splendid age of Louis XIV., has described the hamlet of which he was the lord, not forty miles from Paris, in lines of which the following are a translation :

“ The village rises in theatric show,
Whose simple sons nor lime nor plaster know ;
But in the yielding rock, with self-taught hands,
Each scoops the cell his humble life demands.”

Similar habitations are now possessed by some of the poor in the town of Bridgenorth and Sweinton near Nottingham.

This expedient would on many accounts be more eligible than that to which the natives of the coldest inhabited regions of the globe

are through necessity driven ; which is, to imitate the wild animals of the country, and make a kind of burrow under the surface of the ground. In these subterraneous apartments they are, indeed, well protected from the cold, and out of the reach of the howling tempest ; but they can have no light but from lamps, no convenience for ventilation, and no means of getting rid of the refuse matter which must accumulate during their tedious winters. In this respect they are less comfortable than their fellow-burrowers of the brute creation, which generally lie torpid in the winter-season, and feel none of the necessities of nature. The stench and closeness of these underground huts are said to be absolutely intolerable to any but the natives, who, through habit, seem to be little affected by such inconveniences.

In the warm climates, however, which were probably the original seat of man, amid the exuberant growth of forests, the first permanent shelter made by his hands would naturally be a kind of close harbour, formed of intertwined boughs, impenetrable to the rain overhead by its own green foliage in

summer, and by dried grass and moss in the winter. Milton has given a delightful description of a bower of this sort, the supposed habitation of our first parents in Paradise.

“The roof

Of thickest covert was inwoven shade ;
Laurel and myrtle, and what higher grew
Of firm and fragrant leaf ; on either side
Acanthus and each od'rous bushy shrub
Fenc'd up the verdant wall ; each beauteous flower,
Iris all hues, roses and jessamin,
Rear'd high their flourish'd heads between, and wrought
Mosaic ; underfoot the violet,
Crocus and hyacinth with rich inlay
'Broider'd the ground.”—*Par. Lost*, iv.

Such a dwelling, however, though extremely poetical, would be found rather too unsubstantial for domestic purposes, and art would presently suggest improvements upon it. But here, as I have already intimated in another instance, the want of tools would be a serious impediment to his advance. It is not every country which affords flints, or other stones, capable of being rubbed down, or chipped, to a cutting edge, and shaped into a hatchet ; nor have all savages been endowed with the patience and ingenuity necessary to accomplish that labour, though instruments

of this kind have sometimes been dug up, with which our British ancestors were probably accustomed to fell trees. Little advance, therefore, has usually been made in the art of house-building by tribes unacquainted with the metals; and especially with the most useful of them all, iron. How early this grand discovery was first made is wholly unknown. Tubal Cain, described as "an instructor of every artificer in brass and iron," is mentioned as an antediluvian. The Greeks were well acquainted with both these metals before the time of Homer; and fine iron, and perhaps steel, was manufactured in Scythia, as well as in India, before any records which have reached us. As iron is the most abundant of all metals, and found in the greatest number of places, it is likely that the uses of it, and the art of smelting it,—a simple and easy one—were discovered in many countries independently of each other. Thus armed, the sturdy woodman would find little difficulty in cutting down and shaping the trunks and branches of trees, and constructing a hut or cabin, which would on many accounts be preferred to the natural harbour.

As this is, in fact, the origin of for habitation up to the palace, & the beautiful Doric temple of the which the principles of wooden have been transferred to stone, I sently consider it at some leng various steps towards perfection.

First, however, I have somethin a kind of habitation which, though as a shelter, is scarcely to be recko building contrivances, since the s in it consists almost entirely in tl tion of the stuff which serves as it I mean the *tent*, a contrivance overlooked among the Arts of Li has been employed by whole tribe in every quarter of the globe, earliest times to the present day. in the condition of hunters, and c pastoral state likewise, have foun able home by far the most conven patriarchs dwelt in tents, and alth descendants were compelled to bec makers in Egypt, they probabl houses for themselves till they bec *cultivators* in the land of Canaan

many of the arts of civilisation seem to have been practised among them. The wandering Arabs of the desert, of Mesopotamia, Syria, and Arabia, are dwellers in tents by necessity. The Tartars, in their tilted waggons, seem to unite, in some degree, the conveniences of the fixed and the moveable habitation. Rich as they are in draught cattle, they find little difficulty in transporting both a convenient house and a tolerable quantity of household-stuff to any distance which the convenience of pasture and water for their flocks and herds may require; and when, in a favourable wind, setting up a broad sail, they *navigate* the boundless and treeless expanse of their *steppes* or plains, they partake also of the advantages of the sailor, whose ship is his home.

Tacitus, the great Roman historian, in his admirable description of the manners of the ancient Germans, contrasts the ruder customs of the Sarmatians, the ancestors of these very Tartars, with those of the Germans who were already dwellers in wooden cabins and cultivators of corn. "These," he says, "build houses, carry shields, and travel with speed

on foot, in all which particulars they totally differ from the Sarmatians, who pass their time in waggons and on horseback." He proceeds to describe a still more barbarous and shelterless tribe, not unlike the Bushmen of the Cape, in these terms: "The Fenni live in a state of amazing savageness and squalid poverty. They are destitute of arms, horses, and settled abodes. Their food is herbs, their clothing skins, their bed the ground. Their only dependence is on their arrows, which, for want of iron, are headed with bone; and the chase is the support of women as well as men, who wander with them in the pursuit, and claim a share of the prey. Nor do they provide any other shelter for their infants, from wild beasts and storms, than a covering of branches twisted together. . . . Yet even this way of life is, in their estimation, happier than groaning over the plough, or toiling in the erection of houses."

The hunter-tribes of North America, unacquainted with the arts of weaving or felting, of which the natives of the Old World avail themselves for this purpose, but skilled in *leather-dressing*, cover their tents with the *skins of their buffaloes or wild oxen*.

Some of the Asiatic monarchs, in their great hunting expeditions, lodge, with their train, in tents, or rather in a town of tents, of vast compass, divided and fenced in by screens of canvas, hung with rich silks and gold embroidery, and affording all the luxuries of a palace. The tent has always been the dwelling of soldiers when on active service: before a blockaded city, or when in winter-quarters, they are sometimes more warmly lodged in huts built of wood or clay.

The rudest structure of the hut kind seems to be one which is still the only habitation occupied by some human beings, and is framed of a few poles set in a circular form, and meeting at top. Upon these are fastened leafy branches, sheets of bark, turf, or bundles of reeds, so as to give some protection from the descending shower. An entrance is left open on that side which is least exposed to the cold winds; to correct the chilliness of the night air, a fire is kindled on the ground facing the entrance, and the inhabitant takes his repose stretched within his cover, presenting his naked feet towards the grateful flame. It is impossible for shelter to be

more cheaply provided by art than by such a contrivance.

The *shed* is a small advance beyond that preceding in point of comfort. This supposes an upright back already provided, from which is thrown a sloping roof, resting upon a front and sides. Nothing can possibly be more simple than the manner in which that extraordinary race, the gipsies, construct a dwelling of this kind. They seek out a wide dry ditch, backed with a high bank. From the top of this to the lower opposite side they lay a row of rough poles, which they cross with leafy boughs, wattled in, so as to form a sloping roof, capable of keeping off and carrying off a shower of rain. One end the ends they close in with poles wattled in the same manner; the other they leave open for an entrance. The hollow of the ditch forms their apartment, strewn perhaps with fern or withered leaves, in which they lie at least as snug as a hare in her form. It must be allowed, however, that they are not entitled to all the merit of this ingenuity, for the *ditch* is ready dug to their hands. When *these* people aspire to a hut or hovel, the

contrivance goes little further. They stick in the ground a row of flexible poles or stakes, which they bend round so as to make an arch. This they cover with an old canvas tilt, like that of a carrier's waggon; and creeping under it, find their lodging sufficiently ample. But this, again, is not all their own; for they must beg or steal the canvas, which is the most material part of the fabric.

The real *hut*, or rustic house, as first made by the native of a woody country, must have been constructed of the material ready provided to his purpose by nature, namely, timber, or wood. This substance possesses many excellent qualities for the builder's use. It combines strength with lightness, toughness with flexibility: it is readily fashioned by the workman's tool, yet has sufficient hardness to resist external violence, or the decay which is caused by air and moisture, at least for a considerable time. The trunks of trees, presenting a kind of natural columns capable of supporting the vast weight of the branching heads, would then be selected for the frame of the intended fabric. They would be taken

of such a size as the workman could easily manage, stript of their branches, pointed, and driven into the ground at suitable distances. Probably, four main posts set in a square or oblong form would afford space enough for the first humble dwelling. These would be connected by four smaller trunks or beams laid horizontally on their tops, and fast bound with slips of bark or tough twigs. The intervals between the posts would be filled up with slenderer upright poles, stuck in the ground, and interwoven crosswise with sticks or boughs, so as to make a sort of wicker-work. It was in substantial huts of this kind that the Romans found the ancient Britons. But as wattled walls could not be made quite close, the contrivance would soon suggest itself of stuffing its chinks with moss, and daubing the surface over with moist clay, which might harden in the sun. The roof would at first be a flat one, made by laying poles, by way of rafters, across the beams, and upon these, branches of trees with the leaves on, mixed with dried grass, reeds, or *the like*. In hot climates, the large broad leaves of the palmetto or other similar trees

would offer a ready covering. It would soon be found, however, that the water of a very heavy shower, lodging upon a flat roof, would soak through, notwithstanding all the pains that could be taken. The obvious remedy for this would be a sloping roof, to carry off the rain as it fell; and this would easily be formed by making the hinder posts of the hut taller than the front ones, whereby the side beams, the rafters, and the whole roof, would take an oblique direction from the back to the front. The art of thatching would soon be invented, by means of which a thick covering of straw or reeds is firmly fixed on the rafters, adding greatly to the warmth and snugness of the dwelling, and forming a very complete defence against the soaking of rain or snow. The "straw-roofed cot," with the swallow twittering from the eaves, and the sparrow, wren, and titmouse nestling in the thatch, is a charming feature in the rural scene. But a thatching of straw implies the cultivation of corn, and it is therefore within the reach of none but the regular husbandman.

The entrance of the habitation would vary.

according to the climate, and the security requisite against unwelcome intruders. In a hot country, not infested with dangerous animals, perhaps the builder would leave one of the shorter sides quite open ; but where the cold or the attacks of wild beasts were to be guarded against, he would leave only a small aperture, probably not so high as himself, which he would contrive to close occasionally by a strong hurdle, or a bundle of sticks. This, at first, would also be the only inlet for light, and outlet for the smoke of his fire ; but, for the latter purpose, he would soon find it more convenient to make a hole in the roof. The ascending quality of smoke, and the advantage of providing an escape for it while his door remained safe shut, would suggest this improvement.

Huts similar to those I have been describing are at this day in use, not only with barbarous nations, but among the new settlers in the wilds of America, who are obliged to pass some years in a state little removed from that of savages, till by the culture of the *ground* they are able to improve their condition. Their *log-house* is a substantial edifice

of rough timber, made of thick trunks or logs of equal lengths laid horizontally upon each other, and fastened at the ends into upright posts by means of notches or mortises. The crevices are plastered with clay mixed with moss or straw. The roof is made either of bark or split boards; the fire-place is a hollow pile of stones, above which a hole is left in the roof for the smoke to pass out. Another hole is made in the side for a window, which is occasionally closed with a wooden shutter. Thus a place of shelter is procured, sufficient to answer every necessary purpose, though destitute of most of the comforts and conveniences which we are so happy as to enjoy in our habitations.

The progress gradually made by men in the use of materials of another kind, will be the subject of my next letter. Adieu.

LETTER XVIII.

ARTS OF SHELTER CONTINUED.

MY DEAR BOY.— In my last epistle I proceeded as far as the substantial log-house of an American settler ; but I must now go back a little to consider the expedients practised by the inhabitant of a bare and open country, who needs shelter the more, in proportion as nature has the less provided it in surrounding objects. The turfy or peaty covering of the earth, or the stones encumbering its surface, are the only materials presenting themselves for the erection of his humble hut. These he piles up so as to form four thick walls, the crevices of which he stops up with moss or clay. From the top of them he springs his roof, which he cannot well make without a few poles or beams for rafters. His covering *is either green sods, or twigs of heath, which he binds on with ropes twisted from long*

grass, and strengthens by the weight of large flat stones. Thus, in some snug hollow, he defies the wintry blast which howls around, and rears securely his hardy offspring. Of such habitations in their very rudest form specimens have been given as they exist in the Western Isles of Scotland, and to this day the Highland hut and the Irish cabin are equally rude.

But though human beings may exist with no better provision for shelter than those above described, yet an attention to the comforts and conveniences of life would soon suggest a variety of improvements. Before I attempt to give you a general notion of these, it will be proper to speak of those additional materials for building which art has discovered, or has employed to much greater advantage than as they are presented by nature.

The substances available for these purposes were obviously to be sought among the various mineral matters lying beneath men's feet, or heaped up around them—earth and rocks, or stones. From stopping up with clay or mud the interstices, or smearing the surfaces of the logs, poles, or wattling of a

wooden hut, the step was easy to making entire walls of these substances, or filling in with them a framework of timber. Both these methods have been immemorably practised in our own country, as in many others. In several of our counties, mud-walled cottages are frequently seen in the rural villages, and when built with skill, and coated with a white or yellow wash, they are neat, as well as warm and solid. Farm-houses, and mansions of country gentry constructed of wood and plaster, may still be seen, which have stood for three or four hundred years, and are among the oldest specimens of domestic architecture left in the country. Some of these, called timber-houses, have their beams curiously carved, and painted black, while the rest is of white plaster, and the effect is strikingly picturesque.

For all building purposes, however, where strength to resist assaults, unusual loftiness, or imposing dignity was required, stone, where it could be obtained, was obviously the most appropriate material. But the loose stones scattered on the face of the soil are usually too irregular in their form to fit

closely together and make a solid fabric. Art therefore had recourse to the vast masses of rock lying on the earth and stretching beneath its surface; and, by means of proper tools, cut out of them pieces of convenient sizes, which, when duly shaped and smoothed, might be applied to each other, so as to raise a structure perfectly firm and even. The best kinds of stone for the mason's use are those called *freestones*; which name is given them from the freedom with which they yield to the stone-cutter's tools while in the quarry, although they become hard upon exposure to the air. The composition of these stones is sand and calcareous earth, bound together by a natural cement. Other sorts are harder and more durable, but the difficulty with which they are wrought is reckoned to overbalance this advantage. The practice of working quarries is of very remote origin, and the remains of many ancient edifices still exist, which astonish by the vast bulk of the single stones of which they are composed, and prove the excellence of the material.

Walls and gates in this style of architecture still exist, which stand merely by their own

vegetal and mineral without cement of any kind. Human ingenuity has sometimes arrived itself at masses of stone in a different manner. The cave-temples of India, and some of the oldest Egyptian ones, are not built up, but scooped and carved in the hard and solid rock itself with an amount of skill and labour perfectly astonishing. Long rows of decorated canals are hollowed out in a similar manner in the cliffs and rocky ridges of Egypt and some neighbouring countries.

It is the business, however, of art not only to employ the gifts of nature to the best advantage, but to find substitutes for them where they are wanting. When the comfort of a stone building had been experienced, men set about discovering some other material which might supply its place in countries where it could not be procured. It was soon found that earths of the clayey kind possessed the property of becoming hard in the fire; and as, in their soft state, they might be moulded into any shape, an opportunity was plainly given of forming a sort of artificial stones, more easily brought to the *desired* regularity than the natural ones. The

art of *brick-making* was therefore one of the early inventions of mankind. We are informed that it was practised among the ancient Egyptians; indeed, some of the pyramids are built or cased with bricks; and the stupendous walls of Babylon and the lately-discovered ruins of its palaces, and those of the famous Nineveh itself, were all constructed of them. In hot countries, where rain seldom fell, the heat of the sun was thought sufficient to give the clay a due degree of hardness; and to this day many towns and villages in the East are built with bricks baked in the sun, in consequence of which, a heavy unexpected shower will wash down whole houses. The substantial way has always been to burn them with fuel; and this is done sometimes in buildings called kilns, and sometimes in piles raised in the open air, in which the raw bricks, or regular shapes of clay made in a mould, are disposed so as to leave a kind of channels for the fuel, all communicating with a fireplace at the bottom of the pile. The heat is applied gradually, and is continued till the whole have acquired a hardness which ought

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upon the roof, and, being regular in their shape, are capable of fitting very exactly to each other, and forming a neat and effectual covering. They have the fault of being brittle and somewhat heavy; but, for towns especially, they have the important advantage of not being combustible. After the fire of London, the use of thatch was properly forbidden in the city.

In this country, however, we are fortunate enough to possess, by the free gift of nature, a better material for this purpose than either tiles or thatch, in our great quarries of slate; a kind of stone naturally disposed in layers, and which separates into thin broad leaves under the tool of the workman. Slate is of various colours and degrees of fineness. That which divides into the thinnest leaves is in general to be preferred, since, with sufficient solidity to resist the weather, it makes the least addition to the weight to be supported by the roof. Considerable skill is required in laying it on, so that the lower end of one slate may just lap over the upper end of another, and fit so closely, that wet can beat in between; and

wind may have as little hold of it as possible. Such a covering both answers the purpose very effectually and is very durable; and where slates of a good kind are to be procured on moderate terms, houses are seldom covered with anything else.

A very important article of the artificial building-materials remains to be described, which is the *cement*. Bricks can never be made of great size, because they would warp in drying: these, therefore, or stones merely piled upon each other, would make a very loose wall, easily thrown down, and penetrable by the wind and rain: as you may, perhaps, have observed in those parts of our country where stone walls instead of hedges serve for fences to the fields. It was therefore necessary to find some substance which would completely fill up the chinks, and then, by hardening, would bind all the pieces together, so as to form, as it were, a single solid mass of the whole wall. This has been done by the invention of *mortar*. The basis of the compositions used for mortar is *lime*, a substance never found pure in nature, but made by burning, or calcining, any of those

earths which are called calcareous, or lime-stones. Of these it is the essential property to dissolve in acids. If, then, you were in an unknown country, and provided with a bottle of nitrous or muriatic acid, you might discover whether any stone or earth was fitted for making lime, by observing whether it effervesced strongly on pouring one of these acids upon it. The calcareous earths most commonly met with are chalk, sea-shells, marble, and lime-stones of various colour and hardness, often composing whole rocks and quarries. Of these, the hardest in their natural state generally yield the strongest lime when burned. The process of burning is carried on in a kiln, of a sort of conical form, with a fire-place at the bottom, and open at top. The calcareous earth, broken into pieces, is laid in layers alternately with the fuel, and a very strong fire is kept up during several hours. At the end, the earth is found to be converted into lime, which is effected by the dissipation of the water it contained, and also of a kind of air or gas, which the chemists have named carbonic acid. It is now of an acrid and caustic

nature, and imbibes water with great rapidity, heating with it, and falling into fine powder. By the addition of water it is said to be *slaked*, in which state it remains cool, but is still deprived of its carbonic acid, which it does not recover till after a long exposure to the air. It is this fresh-slaked lime, mixed into a paste with sand and water, which forms mortar. The best sand for the purpose is the sharpest and coarsest; and the ingredients cannot be too thoroughly mixed. Good mortar will in time become as hard as stone itself; nay, in some very old buildings, especially those of the Romans, whose bricks were thin and their mortar excellent, this cement has held a wall together after the stones or bricks were almost crumbled away. The manner of using mortar in building, is to imbed every single stone or brick in a layer of it, by spreading it with a trowel over the surface of the under ones; and between the sides of the contiguous ones, as the work advances. It hardens in proportion as its moisture evaporates, and as the lime in it recovers its gas from the air.

Mortar is, however, employed not merely

as a cement, but as a coating or covering to other materials. Thus it is often spread on the outside or inside of walls, and upon the surface of ceilings. A mode of building formerly very common, and still in use, is to make a frame-work of timber, with upright and cross-beams, and to fill up the intervals with thin slips of wood called laths, which are then coated with mortar. When used for this purpose, it is mixed with chopped hair, to make it adhere the better, and is called plaster. Such buildings are cheap, and neat to the eye, but are defective in warmth and durability.

As it is the quality of mortar to harden in time to a kind of stone, it was an obvious thought to try how walls could be built of it alone. It seems as if this method had been occasionally practised by the ancients in constructing the high and massy walls of defence with which fortified towns were surrounded. At the present day there are parts of England in which small houses are very solidly formed of this material. The method is, to mix a quantity of sand with a proportion of quicklime smaller than that employed

for common mortar, and with a little water; and then having prepared a wooden case of the length and thickness of the proposed wall, to ram in this mixture very hard to the height of a few feet, and suffer it to stand in that state till quite firm and dry. The case is then lifted higher, and the same operation is repeated with fresh materials, till the wall is raised to the intended height. This is not only a very substantial mode of building, but capable of being made to look very neat by polishing. So much for brick and mortar. Farewell.

LETTER XIX.

ARTS OF SHELTER CONTINUED.

HAVING now made a sufficient provision of materials for any improvement in building that human art may suggest, I shall conclude my subject by a slight sketch of those successive steps in contrivance, which have advanced the simple hut or cottage to the comfortable dwelling-house, suited to the occasions of civilised life.

The utility of dividing the space enclosed within the walls into several apartments appropriated to different uses, would very soon become apparent. Of this degree of contrivance several quadrupeds have given an example, who, in their subterraneous habitations, form distinct chambers for lodging in, and for repositories of their various stores of provisions. By means, therefore, of inside walls

or partitions of boards, men would separate their sleeping-room, their cooking-room or kitchen, and their store-room, and these they would fit up differently, making the bed-chamber warm and snug, perhaps with matting hung round it; the kitchen, well protected from the danger of fire; and leaving the store-room in a rough, unfinished state. In the northern, or temperate climates, the floor would often be uncomfortably cold and damp, especially before it was the practice to dig a cellar beneath it; and it is curious to observe the various devices which men have been put upon in different countries for the remedy of this inconvenience. Wandering tribes dwelling under tents, accustomed, for want of seats, to squat on the ground, which is the general practice of such races, and indeed of most of the orientals to the present day, could find no better expedient than to spread the floor with skins, fleeces, rugs, or cushions. The "monarch of a shed," on the contrary, was able to adopt the better expedients of raising his floor somewhat above the level of the earth, hardening it, either with *beaten clay*, or a pavement of stones, or

boards ; and supporting his own person above it on a seat. Thus, as the poet tells us,

— “ First, Necessity invented stools,
 “ Convenience next suggested elbow chairs,
 “ And Luxury th’ accomplish’d sofa last.”

The erect carriage, and alert and active habits of Europeans, and the slouching and indolent ones of Asiatics, are more dependent than would at first be supposed, on their respective habits of sitting on their heels and lolling on cushions, or placing themselves erect on a bench, or chair, with a table before them.

By the art of the carpenter in squaring timber, dividing it into thin boards, smoothing it, fastening pieces together by mortises and dovetails, and other devices for fashioning it to all sorts of purposes, its usefulness as a material were exceedingly increased, and numberless conveniences were produced by its means which the wild inhabitant of the woods could never have thought of.

The great evil of a smoky house would soon put the inhabitant upon devising some better method of carrying off the smoke than through a mere hole in his roof. He would

remove his fire-place from the middle of the room to one of the outside walls; and having enclosed it at the sides with stone or brick, he would continue the structure up to the top of the house, forming it at a certain distance from the ground into a sort of tube or funnel, through which the smoke might be conveyed away clear from the building. Thus he would have an open fire-place below, for warming himself and cooking, terminating in a chimney above. This excellent invention, which contributes more than almost any other circumstance to the comfort of a house, would probably cost many trials before it was brought to perfection. In fact, a writer of the time of Queen Elizabeth tells us, that one of the things in which old men noted an advance of luxury in their time, was the multitude of chimneys lately erected. In their young days there were not above two or three, if so many, in most uplandish towns of the realm (the religious houses and manor places of their lords always excepted, and peradventure some great personage), but each *made* his fire against a *reredosse* in the hall, *where* he dined and dressed his meat. There

is reason, indeed, to believe that the ancients, even after they had acquired great skill in most parts of architecture, were little acquainted with the construction of chimneys, which would of course be most studied in the colder climates. In the greater part of these, the stove is preferred to the open fire for warming rooms. This consists of a kind of oven, heated from the outside, and projecting into a room, to which it communicates through its body an equable warmth to the whole apartment, but accompanied by a closeness extremely oppressive to those accustomed to an open fire.

The admission of air and light would soon, even in the hut, be effected rather by aperture in the walls, than by the open door. These would be provided with shutters or lattices, to close occasionally against the wind and rain, and during the night. But it might long exercise the invention how to contrive a method of lighting an apartment, while at the same time it was sheltered from the inclemencies of the weather. Some semi-transparent substance stretched over the window-frame would be thought of for this purpose;

and we find that, in different countries, thin cloth, oiled paper, the fine membranes of the intestines of fishes, and other similar substances have been made use of. A kind of transparent stone called *talc*, which divide into thin leaves, would be a still better material; but the difficulty of procuring it in large pieces, even in the few countries where it is found, would make its use in windows of great rarity. We can scarcely conceive of magnificent and luxurious palaces, like those reared by the great Mohammedan sovereigns of India, or that of the emperor Nero at Rome, without glass windows, so much required to exclude the pouring rains of the warm climates, and sometimes, even, the cold. It is however certain, that though the manufacture of glass was early known, vases and phials formed of it have not been found even in one of the Egyptian pyramids many ages elapsed before the method was discovered of slitting the blown bubble and flattening it into a plate. Even after this discovery was made, which seemingly almost immediately have suggested the employment for windows, it was very long

a luxury then so expensive came down to common use. Painted windows, presented by some munificent benefactor to adorn a cathedral or abbey church, seem to have long preceded the humble casement of the private dwelling. So late as the time of Henry VIII. a satirical poet reproaches the monks with—

“ Building sumptuously
Their houses royally,
With glass windows; ”

and a full century later, cottages and common farm-houses appear to have been without them. It is surprising to reflect how much pleasure and convenience have been added to men's habitations by the general adoption of this one invention. The solidity of glass rendering it perfectly efficacious in excluding the fiercest shower or keenest wind ; while its complete transparency allows the rays of light to pass with scarcely any obstruction, it was possible, by its means, to make the house at the same time lightsome and warm. The apertures for windows would be in consequence enlarged, and brought down to a level with the eye ; and thus all the advantages of shelter might be enjoyed while the

night was gratified with the beauties of a fine country or a delicious garden.

As houses were enlarged in compass, it would be found necessary to give a new construction to the roof. Instead of a single slope, which would become too weak on account of the length of the rafters, a ridged or angular roof falling each way from the centre would be adopted. In making this, the front and back walls of the building being raised of equal height, a frame of rafters is sprung from the top of each, meeting a beam in the middle, to which they are strongly fastened. Other pieces of wood are nailed across, and thus a firm support is afforded to the material composing the covering of the house, while a rapid fall towards each side procures a ready drainage to the water, or casts off the snow. In warm countries indeed a flat roof is preferred as affording an airy space, out of the way of attacks either from man or beast, on which the inhabitants often pass the night.

It would soon be considered, that the same roof being equally capable of covering buildings of any height, the readiest way of en-

larging the habitable room in a house, would be to raise its walls so as to form one story above another. The art of making floors, by letting timbers into the walls for their support, would then be discovered; as likewise the mode of communication by staircases. Another enlargement would be procured downwards by digging cellars, which would serve excellently for repositories of things requiring to be kept cool in summer and temperate in winter, as well as for stowing articles of cumbersome bulk.

In order to keep the house dry, and convey away what was offensive, drains running under ground and communicating with some main channel would be found expedient. These conveniences were thought of so early, that in the very infancy of the city of Rome, its drains or sewers were a work of such vast labour and contrivance, as strongly to have excited the admiration of posterity. The disagreeable dripping from the eaves of the roof in wet weather would suggest the contrivance of troughs and spouts to carry off the rain-water, and either deposit it in reservoirs, or convey it to the drains.

Out-buildings adjoining the dwelling, for washing, baking, brewing, and other household purposes, and for the lodging of domestic animals, would be found very convenient, and would be erected wherever the space permitted. With these would be connected a paved and enclosed yard, furnished with a supply of fresh water by means of a well,—or a pump, when that machine was invented. Thus every opportunity would be given to promote that *cleanliness* of the person and abode which is certainly one of the principal comforts of the civilised life, and one of its chief distinctions from the savage.

I will here observe that in Europe, during several of what are called the middle ages, men lived in such a state of insecurity, from perpetual wars among princes and nobles, as to make it necessary that all country-houses of any consequence should be in some degree fortified against the assaults of an enemy. They were built with high outer walls, many feet in thickness, often surrounded by a wide and deep ditch, called a moat; there was a *strong gate*, with a tower on each side of it, *and instead of cheerful windows, nothing*

was to be seen on the outside but narrow slits, called loopholes, used for shooting arrows through, or firing guns after these were invented. All these defences made the mansion look like a prison, and rendered the lodging-rooms narrow, inconvenient, and gloomy. It was a usual plan to build the house with a square court in the middle, into which the rooms chiefly looked, which made them dark and dull. In very great houses there were two or three courts, one behind another ; the larger surrounded with the great hall and principal rooms, the smaller for the kitchens, stables, and offices. Some of these old houses, or castles, are still to be seen ; but mostly modernised, and made into cheerful and elegant dwellings.

The enumeration I have here given you of successive improvements in the building art, which is drawn from reality, affords a pleasing instance of the progress of human skill in the exertion of the powers kindly bestowed upon man for bettering his condition. Every encouragement, indeed, has been given to the exercise of *industry*, that great principle, which the poet Thomson has

so well personified as the author of all which renders human existence desirable. — It was Industry, he teaches us, who

pointed out

Where lavish Nature the directing hand
Of Art demanded ; show'd him how to raise
His feeble force by the mechanic powers,
To dig the mineral from the vaulted earth,
On what to turn the piercing rage of fire,
On what the torrent and the gather'd blast;
Gave the tall ancient forest to his axe ;
Taught him to chip the wood and hew the stone,
Till by degrees the finish'd fabric rose.

Thomson's Autumn.

Having now provided you with wholesome food, warm clothing, and a good house over your head, I have fulfilled my engagement, and may decently take my leave. I will not, however, conclude without expressing a hope that this glimpse of subjects connected with important improvements in Arts and Manufactures may serve to prompt and guide your future inquiries.

Farewell.

THE END.

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